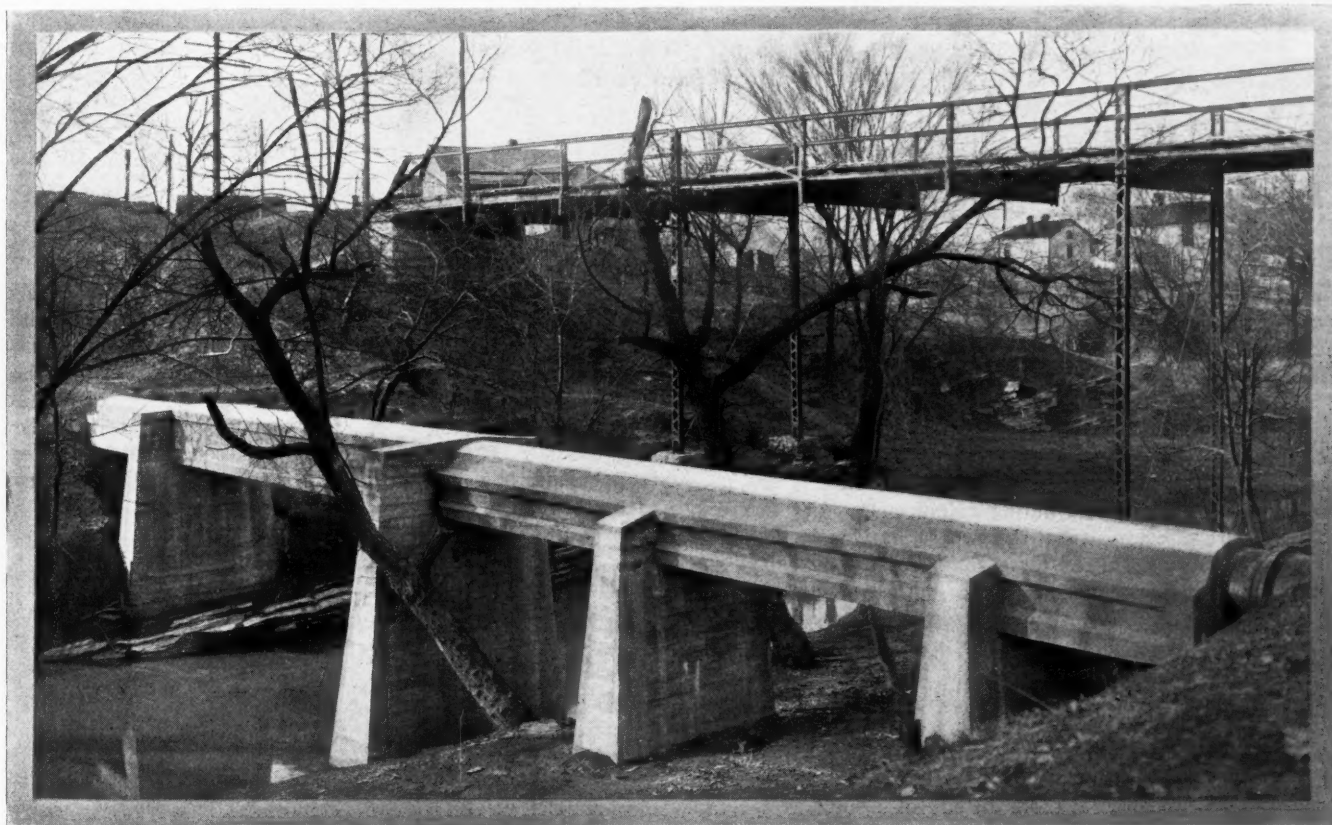


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HIGH LEVEL INTERCEPTING SEWER CREEK CROSSING, COMPLETED

INTERCEPTING SEWER AND SEWAGE PUMPING STATION

Carrying Large Pipe Sewers Across Creeks at Hydraulic Gradient—Reinforced Concrete Pipe in Tunnel—
Pump Well Forty-Seven Feet Deep—Motors Sixty Feet Above Pumps.

By ROBERT HOOKE, City Engineer

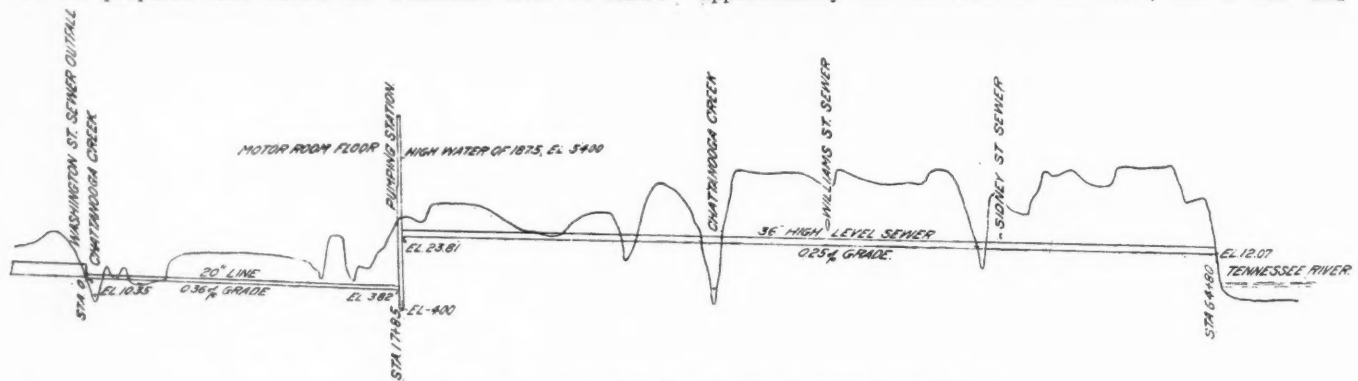
The city of Chattanooga, Tennessee, lies partly in a bend of the Tennessee river, having the latter as its northern and western boundary. Passing through the southern portion of the city is a small stream, known as Chattanooga creek, which discharges into the Tennessee river at the base of Lookout Mountain, about a mile below the city's southern limit. The sewage of Chattanooga, like that of other American cities similarly situated, is discharged directly or indirectly into the river which skirts its borders. Ten of the main sewers of the combined and one of the separate system of sewerage have their outlets into the river, while three

main lines of the former and two of the latter system have their outlets into Chattanooga creek.

The low water discharge of the Tennessee river at Chattanooga is estimated at 8,000, and the maximum high water discharge 700,000 cubic feet per second. During the low water season the creek discharge may get as low as 20 cubic feet per second, but heavy local rains within a few hours bring it to a flood stage and, when the river itself is not at flood stage, develop a strong current. During protracted dry periods the odor from Chattanooga creek, arising from decomposing sewage, has on a few occasions proved offensive

to some of the residents who lived on its banks, which condition was rendered acute in the summer of 1907, owing to the partial damming of the creek near its mouth by debris, which had been dumped into it by a railroad contractor operating in that vicinity and which has never been entirely removed. It was pointed out at the time that the sluggish condition of the creek brought about by this obstruction would be intensified and made permanent by the construction of the proposed dam across the Tennessee river at Hale's

ing surface water. This sewer is 36 inches in diameter and 4,680 feet long. The line consists of two tangents with an angle of $17^{\circ} 32'$ between them, this change in alignment being made by means of a curved invert in a special manhole. It is laid at a grade of 0.25 per cent from the pumping station to its outlet at the river, which outlet has an elevation of 12.07 above city datum. City datum is the zero of the U. S. river gauge on the north side of the city. This was approximately the low-level of the river, but a new and



PROFILE OF 20-INCH LOW LEVEL SEWER AND OF HIGH LEVEL SEWER

Bar, thirty-three miles below the city, as the back-water from that dam would raise the low water level twelve feet at the mouth of the creek and would extend up-stream some distance above all the sewers having their outlets in the creek. The completion of this dam is still a year or more away.

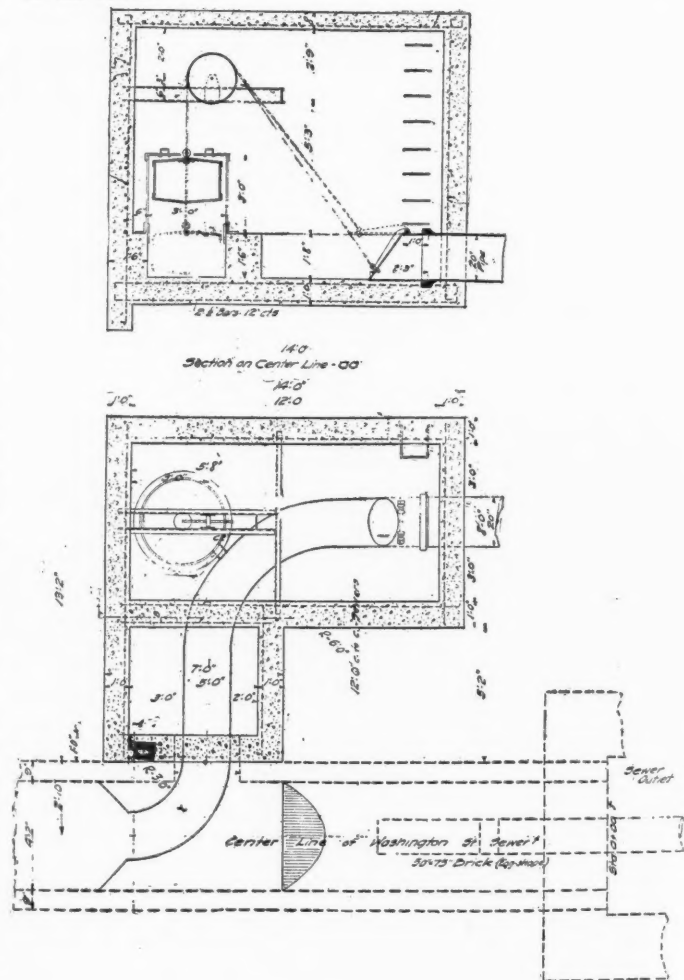
To eliminate the nuisance caused by the odors arising from decomposing sewage in the creek, an intercepting sewer was designed, and has now been partially completed, which provides for the interception, during certain stages of the creek, of the entire discharge from the two sanitary sewers and the dry-weather flow from the three sewers of the combined system, and to conduct the same by the shortest practicable route to the Tennessee river. All of the sewage so intercepted had previously been discharged into the creek.

It was not practical to carry all of this intercepted sewage to the Tennessee river by gravity alone, because the three outlets most remote from the river were but little higher than its low-water stage. It was therefore necessary to pump the sewage, and for this purpose it is led to a pumping station near their junction and there lifted to a high-level sewer having sufficient initial elevation to conduct the sewage to the river by gravity. The three sewers whose flow is thus pumped formerly discharged into the creek at two points about one-third of a mile apart on the north side of the creek. Owing to the tortuous course of the latter, it was impracticable to construct the sewer entirely along one bank, and three creek crossings were made. One is for the combined flow of the District No. 12 18-inch sewer and the Ninth Ward 24-inch sewer, the combined flow of which is carried by a 24-inch low-level interceptor to the pumping station. The second crossing carries the dry-weather flow from the Washington street 50x75-inch brick sewer in a 20-inch line, which also continues to the pumping station. Between the pumping station and the river the high-level intercepting sewer again crosses the creek. The 24-inch low-level sewer is 1,830 feet long to the pumping station and is laid on a 0.25 per cent grade. The 20-inch sewer is 1,767 feet long and is laid on a 0.36 per cent grade.

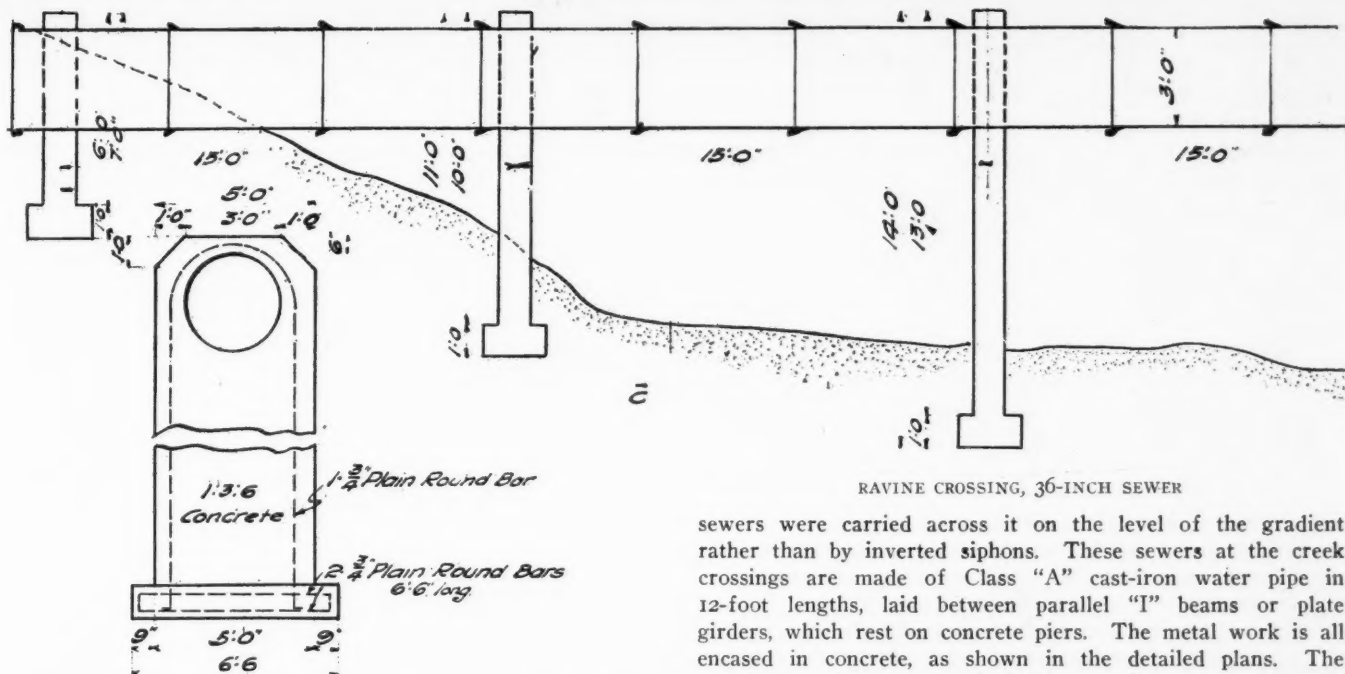
Provision is made at the pumping station for receiving an additional 20-inch sewer whenever it may be found necessary to construct this in order to provide sanitary sewerage for the territory lying southeastward from the pumping station.

On the way to the river from the pumping station the high-level intercepting sewer passes under the Williams street and Sidney street main sewers, the former being a 36x54-inch brick sewer and the latter a 24-inch pipe sewer, and receives from these the dry-weather flow, combined with a certain percentage of rainfall when these sewers are receiv-

higher one will soon be established on account of the Hale's bar dam, 33 miles below Chattanooga. By computing the back-water curve from the crest of this dam it is found that the low-water level at the Chattanooga gauge will be raised between 8 and 9 feet. When this dam is completed, therefore, the bottom of the intercepting sewer at its outlet will be only 3 or 4 feet above the computed low-water level. This, however, will not seriously affect the working of the sewer.



WASHINGTON STREET SEWER OUTLET
Connection with 20-inch intercepting sewer and automatic closing device

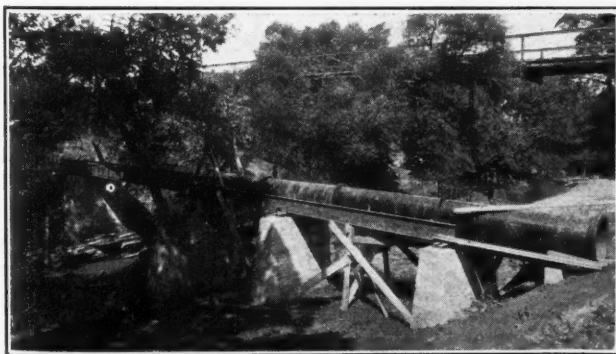


RAVINE CROSSING, 36-INCH SEWER

sewers were carried across it on the level of the gradient rather than by inverted siphons. These sewers at the creek crossings are made of Class "A" cast-iron water pipe in 12-foot lengths, laid between parallel "I" beams or plate girders, which rest on concrete piers. The metal work is all encased in concrete, as shown in the detailed plans. The crossing on the 20 and 24-inch lines consists of two spans of 30 feet each, 18-inch "I" beams 60 feet in length being used in each case. At the crossing of the 36-inch sewer there are three 20-foot spans and one 40-foot span, 36-inch plate girders being used in the latter and 18-inch "I" beams in the former. By using a low-unit stress for the flanges of the girders, say

The high-level intercepting sewer has been completed, and is now receiving the sewage from the Sidney street and Williams street sewers, except when the latter are inundated by back water from the creek. The pumping plant has not yet been completed, and consequently the discharge from the three sewers further up the creek is not being conducted to this plant, although the low-level interceptors for doing so have been completed. The present maximum dry-weather flow from the Washington street sewer is 2.2 cubic feet per second, and that from the two sanitary sewers which drain into the 24 inch line is about 0.3 cubic feet per second, these two latter draining a territory which is as yet but sparsely inhabited.

Back water from the creek will frequently enter the Washington street sewer. As it is not desirable to have this water flow to the pumping station, the 20-inch intercepting sewer will at such times be closed automatically until the back water recedes. This automatic closing of the 20-inch sewer will also take place when the Washington street sewer is discharging more than a certain volume of storm water. The automatic



HIGH LEVEL INTERCEPTING SEWER AT CREEK CROSSING

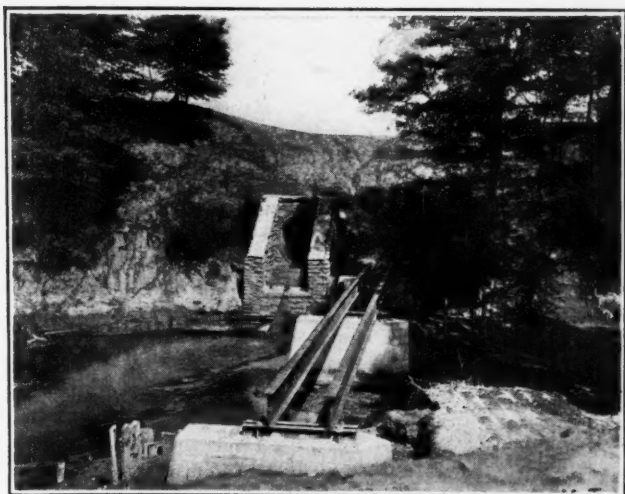
closing device consists of a flap valve at the end of the 20-inch pipe, which is opened and closed by means of a float as the water in the sewer falls and rises.

The low-level sewers are constructed of vitrified pipe except at the creek crossings, which are described further on. Reinforced concrete pipe 36 inches in diameter was used for the high-level interceptor except where this was carried across the creek or through depressions below subgrade, in which cases cast-iron pipe was used. This 36-inch sewer was carried under a number of railroad tracks and 600 feet of it was constructed in tunnel.

As the creek was not in any sense a navigable stream, the

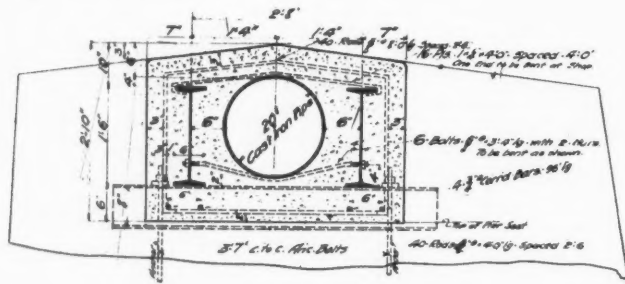


CREEK CROSSING OF 20-INCH INTERCEPTING SEWER, AND OLD OUTLET OF WASHINGTON STREET SEWER



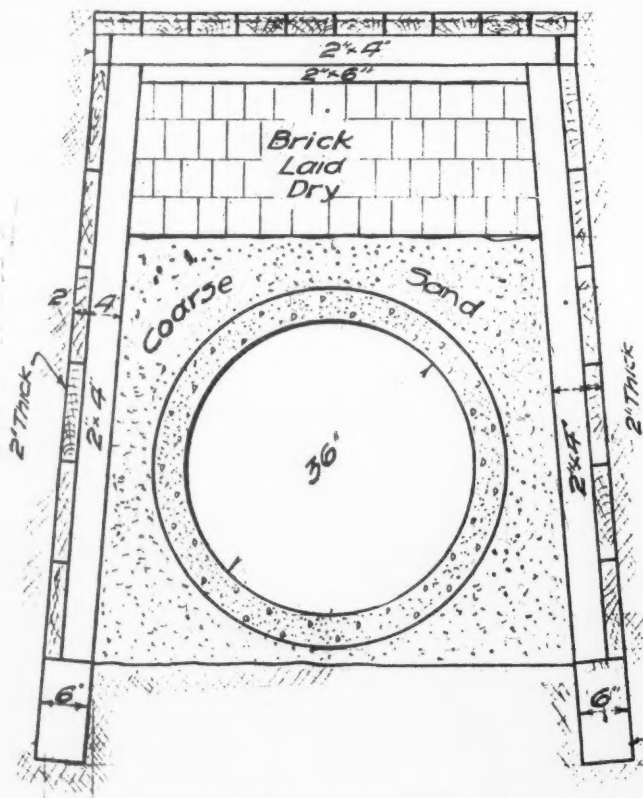
SAME AS ABOVE, DURING CONSTRUCTION

10,000 or 12,000 pounds per square inch, and not too great a ratio of length to depth of girder, the deflection will be of little consequence as affecting the grade of the pipe. By using shorter lengths of pipe than 12 feet it would have been quite practicable to so place the pipe before the concrete is deposited around it as to allow for the deflection due to the weight of the latter.



CROSS-SECTION OF CREEK CROSSING, 20-IN. PIPE

This design for carrying sewers across creeks was introduced by the writer some three years ago with such satisfactory results that he adopted it in the present instance as the one which, if not the least expensive, would be the most effective in withstanding flood and weather conditions with a minimum amount of care and attention. These crossings have been submerged by floods four times this year and without injury.



REINFORCED CONCRETE PIPE IN TUNNEL UNDER RAILROAD TRACKS

SEWAGE PUMPING STATION

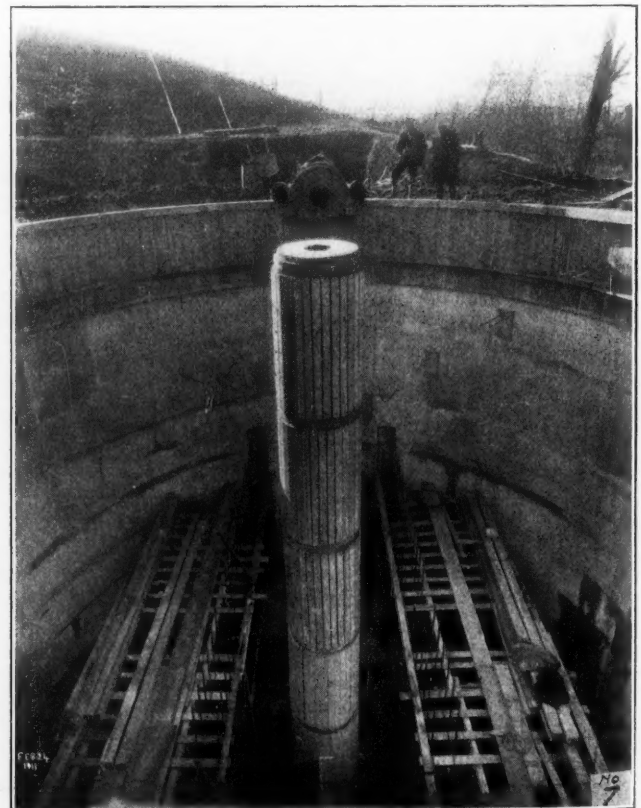
This is located on the south bank of Chattanooga creek near the southern boundary of the city in a section not yet built up. The pump well is circular in form, 36-foot interior diameter at the bottom, and is divided into four separate chambers, consisting of a receiving chamber and three pump chambers. The sewage will first enter the receiving chamber, from which it may be diverted at will into either of the three pump chambers by means of 20-inch Coffin sewer shear gates, operated by hand. The bottom of the pump well has an elevation of -4.0 referred to the city datum. The roof of the pump well has an elevation of 43.0. From this roof, or rather from the plate girders supporting the roof, is erected a steel frame for supporting the rectangular motor room, the floor of

which is to have an elevation of 55.25 or 59.25 above the bottom of the well. The object in placing the motors at this height was to have them above the level of all but one of the three greatest floods which have occurred in the Tennessee river at Chattanooga. The pump well will be entered by means of a concrete stairway anchored to the circular concrete wall of the well, which stairway is reached from a door at the north side of the well at an elevation of 30.0. The motor room will be made accessible by means of a reinforced concrete stairway erected on the roof of the pump well.

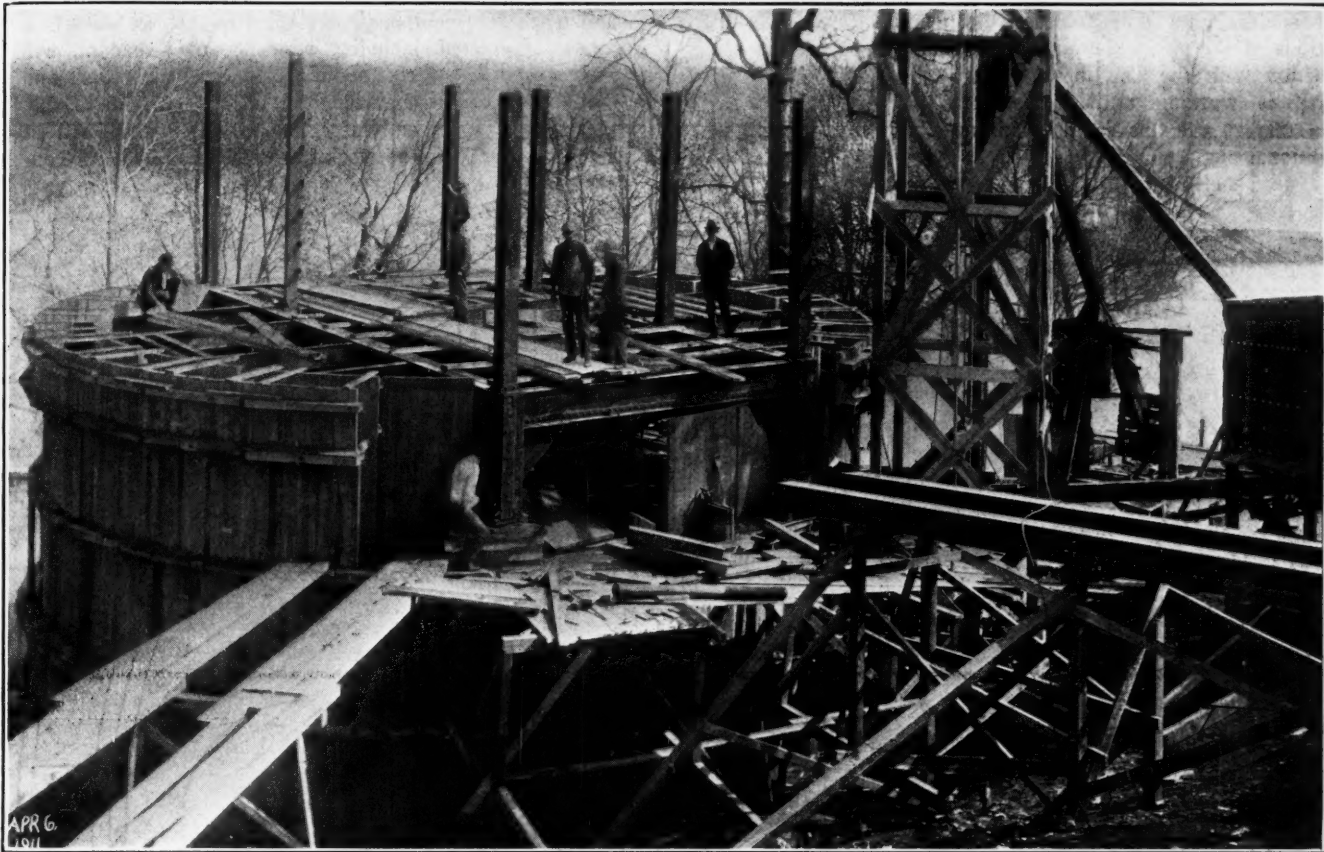
The pump well will at present be supplied with two 12-inch centrifugal pumps, each direct connected by means of a vertical shaft to a 75-horsepower electric motor, provision being made for the future installation of a third pump, to be located in the middle pump chamber, whenever—by reason of the construction of the proposed additional low-level sewer to the pumping station—increased pumping capacity becomes necessary. The capacity of each of the two 12-inch pumps is designed to be 10 cubic feet per second against a mean actual head of 26.25 feet. The pump shaft, which is of somewhat unusual length (about 60 feet) on account of the great elevation of the motor-room floor above the bottom of the well, will be carried on a ball-bearing located just below the motor.

To prevent the possibility of the motors being subjected to overload when working under a reduced head for a considerable period, they have been made of higher power than would otherwise have been required. The present combined dry-weather flow of sewage from the two sewers discharging into the pump well during the morning hours, when at a maximum, is 2.5 cubic feet per second. The combined capacity of the two sewers when flowing full would be 20.0 cubic feet per second. Provision is therefore made for a large future increase in the volume of sewage to be carried to the pumping station. At present it is intended to admit rainfall into these two sewers to the limit of their capacity when not working under head, when 18 to 20 cubic feet will be delivered to the pumps.

Ordinarily a single pump, working intermittently, will handle all the dry-weather flow, pumping the sewage from a height



INTERIOR OF PUMP WELL
Showing steel reinforcement of partition walls

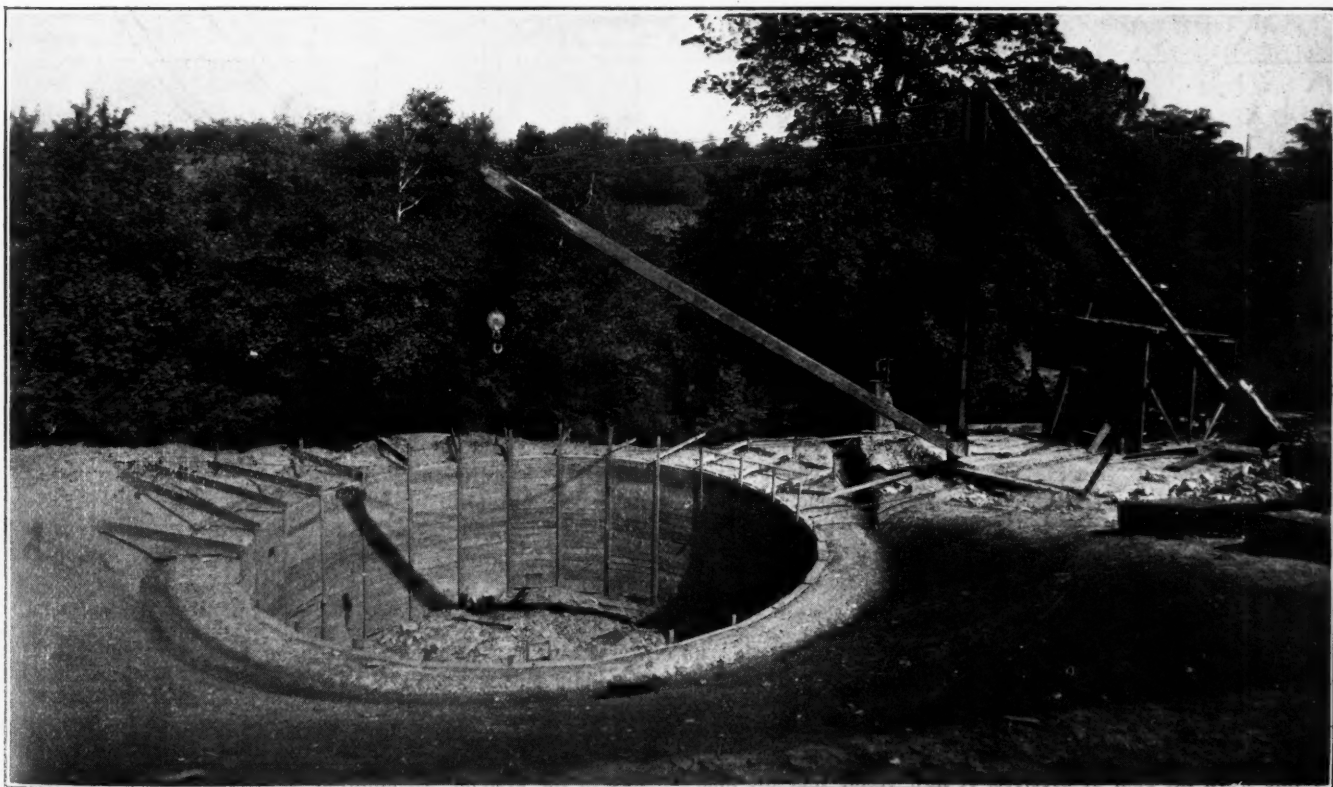


PUMP WELL OF SEWAGE PUMPING STATION
Portion of steel framework which is to support motor room is in place

of 6 feet above the floor of the well down to a level with the surface thereof (the pump itself being placed in a pit depressed below the floor level), when the pump will be automatically stopped. It will be automatically started again when the sewage level has again reached the height of 6 feet above the bottom of the well. When the volume discharged into the first well is, by reason of rainfall, increased beyond 10 cubic feet per second, the single pump working will not be

able to prevent the rise of the sewage level until it flows through the 18-inch iron pipe into the chamber where the other pump is located, which also will be started automatically when the sewage has attained a certain depth around it, and the second pump will be automatically stopped when the discharge into the well is reduced to 10 cubic feet per second.

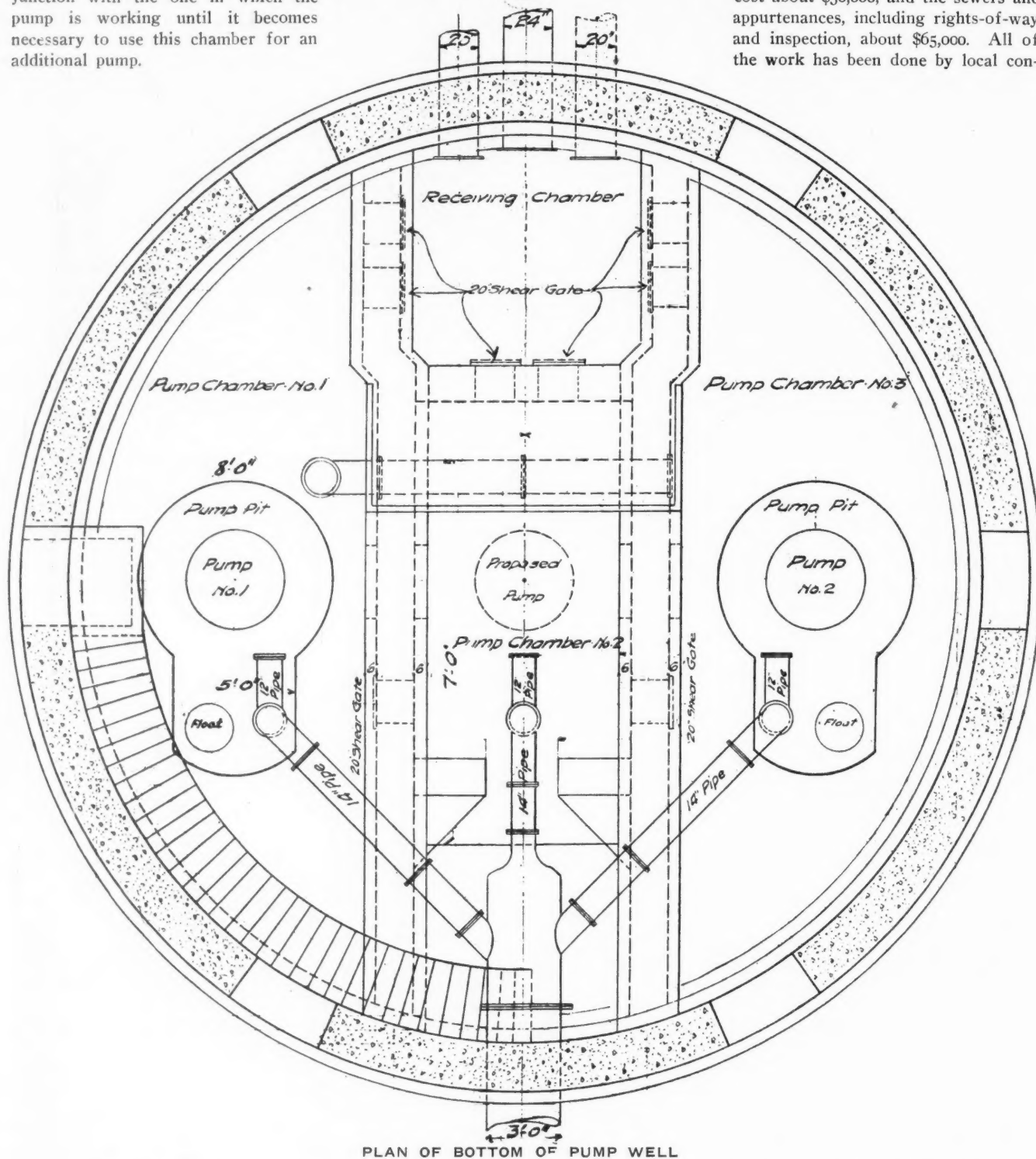
In order to increase the capacity of the storage reservoir



VIEW OF PUMP WELL OF SEWAGE PUMPING STATION, SHOWING SOLID ROCK IN BOTTOM

for sewage, and thus increase the length of the working periods of the pump, the middle chamber will be used in conjunction with the one in which the pump is working until it becomes necessary to use this chamber for an additional pump.

tion and machinery equipment and the two-acre lot on which the station is erected, including residence of attendant, will cost about \$30,000, and the sewers and appurtenances, including rights-of-way and inspection, about \$65,000. All of the work has been done by local con-



R. D. Wood & Company, of Philadelphia, Pa., will furnish the pumps and the General Electric Company the electric motors and automatic starters. The pumps and motors have for some months been ready for shipment, but on account of the delay in the completion of the building, owing largely to floods, the contractor is not yet ready to begin their erection. It is hoped that the pumps will be in operation by the middle of June.

COST OF THE WORK

The original estimate of the cost of the intercepting sewer, pumping station and machinery, including site, rights-of-way and inspection, was \$95,000, and the general council provided for this work the sum of \$100,000. It now seems that the final cost will not exceed the original estimate. The pumping sta-

tractors—the sewer work by the Noll Construction Company and the pumping station by H. S. Bosler.

ADDITIONAL SEWERAGE STATISTICS.

Since making out the table of sewerage statistics we have received an additional report from Seattle, Wash., stating as follows:

Construction is in charge of the city engineering department, and maintenance of the street and sewer department. There are 8,382 inlets with catch basins, none without, of which 1,511 were built during the year. There were 60,183 cleanings of catch basins, by which 30,520 cubic yards of material were removed, spoon shovels being used. There are 314.17 miles of combined sewers in the city, of which 57.72 were built by contract during the year. There are 4,633 manholes and 382 flush tanks in the system. In addition, sewers are flushed by hose attached to fire hydrants. Ventilation is through manholes.

VALUE OF NEW YORK'S GARBAGE

Method of Treating It at Barren Island — Amounts Treated — Sums Received by Company from City and for Salable Products

THE commercial value of New York's garbage to the contractors who dispose of it, the New York Sanitary Utilization Company, is about \$400,000 a year (when delivered to them at the docks), in addition to the \$200,000 a year which the city pays the company under the terms of a contract which will expire in 1912. The cost to the city of collecting the garbage and delivering it to the docks (after which the company bears all expense) exceeds by about \$50,000 the actual commercial value.

The figures given in this article, taken from various official reports and other reliable sources, show that in the year 1908 the total amount of garbage handled was 328,646 tons. According to the estimate here presented the value of this garbage, that is, the net revenue derived from the reduction process, was \$369,216. In addition to this, the company received the sum of \$192,444 from the city, under the terms of the contract. The cost to the city of collecting the garbage and hauling it to the docks was \$420,422.

A brief sketch of the process of reducing the garbage and extracting the valuable ingredients which is now in use was given by Edward D. Very in 1908, in a paper before the New York Section of the Society of Chemical Industry. The figures quoted in this article are taken from records for the year 1908, and refer to the process and machinery then in use, but we believe that many of them have not heretofore been published. Since that time machinery for extracting grease by the use of naphtha has been installed.

Mr. Very described the operations as follows:

At Barren Island the garbage is packed onto an outboard conveyor and is then conveyed to the second story of the plant and passes through chutes to the digesters. Its reduction is then accomplished by the Arnold-Edgerton process, which is performed purely by mechanical means. The digesters are large tanks holding approximately eight tons. When filled, they are sealed by a cap which is held on by bolts. Steam is introduced into the digesters at 80 pounds pressure and the mass is cooked for a variable time, depending on the material, which varies from season to season. The vapor escaping through the vent is condensed by a jet condenser and thence passes to a sewer.

From the digester the material, which is now a pulpy mass, is removed to a tank, which has a capacity of four digesters, for the purpose of facilitating the work. From the tank it is run into forms made of sacking and racks and then put under an hydraulic press. Pressure is then applied and the water and grease are expressed. The water and grease go to a perforated trough, and thence by pipes to a settling basin, where, by flotation, the grease is separated and then taken off and barreled. The residue from the press, known as tankage, is carried by conveyor to a direct heat dryer, where the remaining moisture is driven off; and from the dryer passes to a screen, where the material is ground and screened. From the screen the material falls through chutes into hoppers and thence to bags for shipment.

The average garbage received at the plant contains: Water, 71 per cent; rubbish, 6 per cent; tankage, 20 per cent; grease, 3 per cent. The grease is of low grade and dark brown color. It is largely used in making soap and candles. The greater portion is shipped abroad. Tankage is the solid, fibrous matter, and is used as a fertilizer base or filler. It contains a small percentage of nitrogen, ammonia, phosphoric acid and potash. The liquid from the grease has no value, as it contains a very small percentage of ammonia.

The following is an estimate of the receipts and expenses of the Utilization Company in 1908, made as the result of an official investigation:

Receipts

Grease, 3 per cent of total garbage, 9,859 tons, at \$60. \$591,540
Tankage, used for fertilizer, 65,729 tons, at \$5. 328,646
Cash from Department of Street Cleaning. 192,444

Total receipts\$1,112,630

Disbursements

Transportation, from docks to works, by scows, 328,646 tons, at 12c. per ton. \$39,437.52
Unloading, 5c. per ton. 16,432.30
Coal, 22c. per ton of green garbage reduced. 72,800.00
Labor, 14c. per ton. 46,800.00
Repairs and supplies, 5 per cent. 50,000.00
Depreciation, 10 per cent. 100,000.00
Administration and legal expenses. 225,500.00
Balance, gross profit. 561,660.18

Total\$1,112,630.00

The capital stock of the company is \$1,300,000; for a 6 per cent dividend \$78,000 would be required. The sum of \$192,444 paid by the Department of Street Cleaning is also included in the gross profit as stated above. The net value of the garbage delivered at the docks in 1908 was than \$369,216, or if dividends are deducted \$291,216.

In order to fully understand these figures some further information regarding the items follows:

Tons.—A cart load is assumed to weigh one ton. This estimate was confirmed by exhaustive tests made by Messrs. Parsons, Hering and Whinery in connection with a report to the Board of Aldermen December 31, 1907. The number of cart loads delivered by the city at the docks to the company in 1908 was 328,646.

Grease and Tankage.—The percentage of grease recovered from New York garbage by the process employed has been reported to be 3 per cent. The average price for grease in 1908 was \$60 per ton. The tankage, which is used for manufacturing fertilizers, has been stated to be 20 per cent, and its value is put at \$5 per ton.

Transportation.—The estimate of 12 cents per ton for transportation by scows is based on the city's contract for disposing of ashes and rubbish in a somewhat similar manner. The price which it pays for this is 17 cents for transporting and unloading, but the nature of the work is considerably more expensive than that involved in the handling of garbage. The following estimate of cost of unloading alone is submitted. The average scow carries 300 tons. Ten men at \$1.50 per day easily unload one scow in a day, making the cost 5 cents per ton.

Coal.—The total annual consumption of coal at the reduction plant is reported to be 18,200 tons, estimated to cost \$4 per ton, or \$72,800 = 22 cents per ton of garbage.

Labor.—The estimate of labor is obtained from observation. The average number of men employed is about 70. The average weekly payroll is \$900; the annual payroll \$46,800, making the labor cost per ton of green garbage handled 14 cents.

Repairs and Supplies.—The figure of \$50,000 is assumed arbitrarily.

Depreciation.—The value of the plant is assumed to be within \$300,000 of the capitalization of the company, and 10 per cent is allowed for depreciation, permitting renewal every ten years. The allowance for depreciation is \$100,000.

Administration and Legal Expenses.—These are assumed to be \$225,000. (Probably covers expenses which will not bear too close inspection.)

Interest or Dividend.—This is figured at 6 per cent on the capitalization of \$1,300,000. The profits over and above the amount paid by the city appear to be \$291,216.18, or 22 per cent on the capital stock.

Regarding the cost to the city of collecting the garbage and delivering it to the company at the docks, the following figures are reported for 1908:

Boroughs	Cart Loads	Cost per Load
Manhattan	195,439	\$1.32
Brooklyn	27,839	1.43
Bronx	105,368	1.18

Total\$328,646

The sums paid by each borough to the company under the terms of the contract for disposing of the garbage after delivery are as follows:

Manhattan	\$148,000
Brooklyn	19,444
Bronx	25,000
Total	\$192,444

CATCH BASIN DESIGNS

Gratings and Special Forms of Gutters—Gratings or Bars For Curb Openings—Connection to Sewer

The standard catch basins of Portland, Ore., are simple rectangular wells about 5 feet deep below the roadway surface and about 12 by 30 inches inside dimensions, with walls 6 inches thick. The pipe connecting this with the sewer is placed with its top about 10 inches below the roadway, thus leaving about 3 feet of basin below the pipe. No traps are provided in the basin. The peculiar feature of the basin is the grating in the gutter. This grating extends 16 inches out from the curb, and is composed of wrought iron bars $\frac{1}{2}$ by 2 inches in section spaced 1 inch apart in the clear. These bars, however, are not flat but are so curved that while the outer ends are flush with the pavement those next to the curb rise in a curve which brings the center bar 5 inches higher than the level of the pavement, or within 1 inch of the top of the curb. The object of this probably is to form a sort of dam in the gutter which will prevent the water from flowing over the bars rather than passing through them, when the gutters are flowing unusually full. The projection in the gutter, of course, interferes with the wheels of a vehicle which might be following close to the curb, but it is not ordinarily necessary that vehicles should do so.

Where we have seen such gratings used we have found, as might be expected, that they did not always act as intended, since the gutter water can easily flow out around the bars, providing any obstruction, such as a piece of heavy paper or twigs and leaves, should collect over the grating.

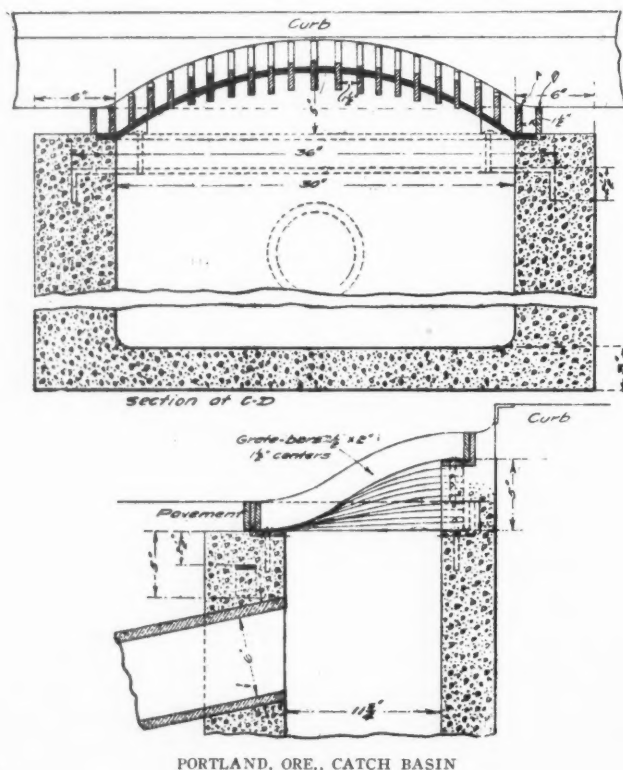
A better construction, it appears to us, is to form a depression in the gutter at the inlet, this depression being approached by a comparatively long slope from above, and by a much more rapid one immediately below. The depression then serves as

a pocket to catch the water coming down the gutter, which can not flow around by way of the pavement. Also, if a paper or other comparatively weak obstacle should spread itself over the grating a head of several inches of water would be formed which would tend to force it through the opening. This depression would form no more objectionable obstacle to wheeled traffic than the Portland grating. It has the additional advantage that it is equally advantageous for use with an opening in the face of the curb, directing the water into such opening and preventing its flowing by. On a steep grade even this depression with a vertical curb opening may not suffice to direct all the water into the catch basin, and in such cases a flat grating of bars placed in front of the curb opening at the bottom of such a depressed gutter will generally be effective. The chief disadvantage of this, perhaps, is the break which it makes in the general appearance of the curb, which may by some be considered objectionable. It does not seem to us, however, that this objection can at all outweigh the practical advantages.

Undoubtedly the gutter grating is more objectionable than the curb opening, and the latter will generally serve the purpose except on quite steep grades, providing it is sufficiently large and not so obstructed by bars or in other ways as to cause paper, leaves, twigs and other matters, such as may be washed from the street surface, to collect in front of and contract the opening. Where a large opening is necessary—and we believe that with modern waterproof pavements these openings are more often too small than too large—some kind of bar is necessary to prevent animals and even small children from falling into the inlet. For this purpose we believe that one or at most two horizontal wrought iron bars set into the masonry at the ends of the opening are better than anything else. These seem less likely to collect such floating materials as we have referred to than do the vertical bars; and should they collect them the water will itself remove them more readily than in the case of the vertical bars. Probably the chief objection is the fact that a comparatively long stick, such as a lath, floating upon the water may be carried into the inlet; but this is possible in the case of the vertical bars also should the stick approach the opening at an angle of 30 degrees or more with the line of the curb.

This matter of storm water inlets is a most important one, and in our opinion has not received anything like the attention which it deserves in most cities. We do not believe that there are any greater absurdities to be found in any of the public works in the city of New York than the catch basin inlets in the Borough of Manhattan. Most of these have curb openings of ample size, but instead of horizontal wrought iron bars many of these openings are provided with heavy horizontal cast-iron bars which carry vertical teeth both above and below, the toothed bar occupying about one-third of the entire area of the opening, but the spaces between the teeth being so small that the effective area of the opening is probably reduced at least 75 per cent and the space between the bottom of the lower teeth and the bottom of the opening being so narrow that it is frequently found stopped with such small articles as apple cores, banana skins, handbills and the like. Other New York inlets are provided with the gutter grating, but instead of having the opening of the basin extend under the grating there is merely a depression cut in the lip of the stone which forms the bottom of the inlet opening, so as to leave a space about one inch deep between the grating and the bottom of this depression. This space is ordinarily found entirely filled with compacted street mud so that it serves no useful purpose whatever. The result is what might be expected, and every storm results in flooded gutters and streets around a considerable percentage of these inlets.

It is of little avail to build sewers of ample capacity if the openings which receive the street water and the pipes which conduct it from the openings to the sewer are not sufficient to remove the water from the streets. This suggests another point in connection with inlets where a great many cities have made mistakes. Because a six- or eight-inch pipe at even a minimum



PORTLAND, ORE., CATCH BASIN

grade is theoretically of ample capacity as a sewer to carry off all the water which will reach the inlet is not a sufficient reason for using such size of pipe as an inlet connection. When water drops from the gutter into an inlet it has no velocity in the direction of the connection pipe, but is a seething mass having more motion vertically than in any one horizontal direction. Under these conditions the opening which removes the water from the basin must be several times larger than that required for carrying a similar amount under normal flow, since the initial velocity through the outlet is very low and is largely diagonal to the axis of the pipe rather than parallel with it. Theoretically the best form of outlet from the basin would be a flat bell mouth, which might be given the same height as the diameter of the pipe used further out, and a horizontal diameter equal to the opening to the full width of the basin. It would be desirable to have at this opening a grating with vertical bars to prevent sticks and other obstacles from wedging themselves in this bell mouth. Instead of such a bell mouth it would perhaps be more practical to approximate it by a flaring opening made in the masonry, and a pipe capable of carrying the maximum runoff at a velocity of not more than one foot per second. In addition, if there is no catch basin at the bottom of the inlet—as in the majority of cases there should not be—it would be well to round the bottom up from the opening toward the back of the basin in the form of a quadrant of sphere or spheroid.

FUNCTIONS OF HEALTH BOARDS

Non-Sanitary Duties Imposed Upon Them—Garbage Disposal a Matter of Housekeeping, Not Sanitation— Plumbing Inspection.

ON April 10 and 11 there was held at the Massachusetts Institute of Technology in Boston a celebration of the fiftieth anniversary of the granting of the charter of the Institute, a part of which celebration took the form of the presentation of a great number of papers upon technical subjects by graduates of the Institute. Among these was one by Edwin O. Jordan, Professor of Bacteriology of the University of Chicago, in which he enumerated a number of lines of endeavor in public health work which he considered to be fruitless and uneconomical. The reason for this, in his opinion, is the continuance in the public mind of the ideas of a few decades ago concerning the origin and transference of contagious diseases. "Two instances of this confusion," he said, "are found in the demand for garbage disposal and plumbing inspection. Sanitarians do not admit that even a grossly improper method of garbage disposal can have much to do with the spread of disease in a large city, nor that diphtheria or typhoid fever or any other disease is properly attributable to the entrance of sewer air into dwelling houses. So firmly imbedded in public belief, however, is the connection of piles of decaying garbage with outbreaks of infectious disease and of 'defective plumbing' with all sorts of maladies that to the average citizen 'garbage disposal' and 'plumbing inspection' bulk largely as the chief, if not the only, activities of a municipal health department."

According to bacteriology disease germs do not breed in garbage heaps, nor can they continue to exist there. It is true that house flies breed in garbage piles and in manure, and that they may carry disease germs to food in the kitchen or on the table. But in order to do so they must obtain the germs from some source, and this source is not the garbage pile. Therefore, in his opinion, it is the source of the germs which should be looked after by the Health Department and not the breeding of flies. Consequently, garbage disposal is in his opinion a matter of municipal housekeeping rather than of public health; and improper methods of dealing with garbage should be dealt with by the police department as public nuisances rather than by the Health Department.

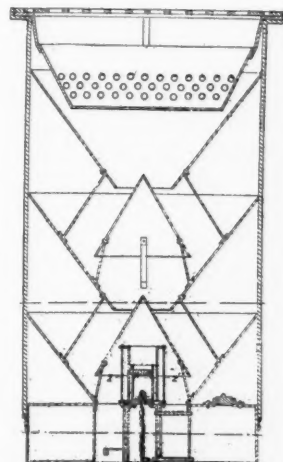
Concerning the danger from sewer gas Professor Jordan said: "If the most recent and searching investigations, such as those of Winslow and others, are to be believed, the actual peril to health involved in the entrance of small quantities of sewer air into houses is so small as to be practically negligible. It may be questioned whether plumbing inspection, as ordinarily admitted, can be shown to have saved a single life or prevented a single case of disease. . . . It might reasonably be maintained that slightly leaky gas fixtures are a much more serious menace to the health of house dwellers than is defective plumbing."

Professor Jordan does not deny that there is a certain amount of value in plumbing inspections nor that it is necessary that garbage be removed and prevented from creating a nuisance; but he maintains that money devoted for health purposes can secure much more adequate returns if used in other ways. Among these he refers at length to safeguarding the milk supply. Now that the public is aroused to the importance of pure water for preventing typhoid, he believes that milk is responsible for much more disease than is the water supply, and he appeals for a more general and adequate control of the milk from and including the milking of the cows to its final distribution to the consumers, recommending general pasteurization where other methods of securing safety are impossible or impracticable. He also strongly urges a more complete and accurate collection and recording of vital statistics, since through these can be learned the efficiency of the methods being employed and in what direction there is the greatest need for further or new endeavors.

DEODORIZING SEWER GAS

While fortunately the majority of American cities do not seem to be troubled with sewer gas, as are so many English cities, there is occasionally one on this side of the ocean which, on account of poor construction or lack of proper maintenance, finds it necessary to adopt some method of diminishing the nuisance from such gas. Among these is the city of Winnipeg, which has been troubled with this question for many years. The latter part of last year a test was made of the Beeman deodorizing machine, ten of these being placed in sewer manholes, where they were operated for three months.

The machine consists of a reservoir containing wood alcohol, the fumes from which impinge upon a disk of platinized porcelain $1\frac{1}{2}$ inches in diameter. This disk, when heated cherry red, remains incandescent so long as the alcohol fumes are supplied to it, which fumes are changed into formaldehyde during their passage over the disk. In addition to the reservoir and disk there are a series of baffles and protectors through which both the formaldehyde and the air from the sewers must pass and which insure a thorough mixing of the two. The whole machine measures about 20 inches in diameter and 40 inches high and is suspended within an air-shaft from the sewer or in the sewer manhole. In the machines used in Winnipeg it was found that one gallon of wood alcohol, costing 62½ cents, lasted nine days. It is suggested that it would not be necessary to place such an appliance in each manhole, but that if one were placed, say, in every fifth manhole the openings in the other four could be closed. City Engineer Ruttan reported that sufficient formaldehyde was produced to deodorize the sewer air that emerged from the manholes. The city of Winnipeg has recently contracted for 50 of these deodorizers at \$75 each.



SEWER GAS DEODORIZER

SEWER CONSTRUCTION IN ST. LOUIS

Large Brick and Concrete Sewers in Tunnel Through Rock and Sand, and in Open Cut—Using Shield and Air Pressure—Eight Miles of Sewer Under Internal Pressure—Tumbling Basin in Tunnel

AMONG the eighteen sewer contracts awarded in St. Louis last year, aggregating \$3,175,000, are several pieces of rather unusual or important work. The River des Peres foul water sewer, two sections of which have cost nearly \$1,000,000, is being constructed for nearly a mile through solid rock in a tunnel, and a third of a mile through a quicksand tunnel. Other large sewers are the Baden public sewer, 23 feet in diameter, and the Harlem creek public sewer, 29 feet in diameter, just completed.

The work laid out by the department for the coming year, while not as costly as that contracted for in the closing year, is more extensive, comprising 26 contracts, aggregating \$2,260,000; while if we add that which is to be started during the next year the total estimate is \$5,435,000. This sum is about one-fourth of the total expenditure for all sewer purposes in the city up to date. Up to a year ago the city had spent \$16,810,593 for the construction, repair and maintenance of sewers. At that time there was 661.61 miles of sewers in the city, divided as follows: Public sewer, 488,193 feet; joint district sewer, 29,481 feet, and district sewer, 2,975,661 feet. The total mileage at the present time is near 700, and the expenditure has probably been raised to nearly \$19,000,000.

The sewers are divided into three classes, one known as public sewers, which are paid for by the city as a whole from public funds by bond issue; another, joint district sewers, paid for jointly by the city and by the property owners in the drainage area effected, and the third, comprising all of the branch sewers and everything but the mains, called district sewers, are paid for by assessment against benefited property.

Of the work now under construction more than 56,000 feet, to cost \$1,640,223, is public sewer; 30,000 feet to cost \$800,166, is joint district sewer, and \$482,879 is the estimated cost of the district sewers. Public sewer for which contracts are soon to be awarded aggregate \$772,000; joint district, \$675,000, and district sewers, \$817,000, estimated cost.

Nearly all of the large sewers have been constructed of reinforced concrete. Not including the sewer constructed last year or that now under contract there is 4,487 feet of concrete sewer. Stone and brick sewer aggregates 74,136 feet, and brick aggregates 1,369,155 feet. There is 2,045,557 feet of pipe sewer, all of small size.

The largest sewer in the city is the Harlem creek main sewer, which is of concrete, 29 feet across and arched to 18.5 feet high at the center. This sewer is 1,016 feet long and is fed by a section 2,100 feet long of 16.3 x 25-foot sewer, besides the smaller sewers that lead into it; and two large branch sewers, North Harlem and South Harlem, connect into it.

The Glaise creek, a 12 foot 6 inch concrete sewer, 3,320 feet long, carries all of Glaise creek and the storm water of its drainage area. Additional sections of this sewer are planned, to cost \$80,000. Baden public sewer (a combined sewer) is the next largest after Harlem, being 23 feet across and of similar construction, the total estimated cost of which is \$876,527.

The River des Peres sewer is the longest yet undertaken; including three sections, 11,563 feet long, in Forest Park known as the Forest Park foul water sewer, it is to be nearly 48,000 feet long. Two sections of 9, 7 and 6-foot sewer extend from the Mississippi river toward the park, a total of 32,600 feet. All of this sewer is of brick. The contract cost so far has been \$987,116, and the other section is estimated at \$283,000, making a total of \$1,270,116. It was planned to tunnel through Forest Park hill, but the Municipal Assembly has refused so far to authorize an election to issue bonds, voting the proposition down

a few weeks ago. It will be necessary to either tunnel through the hill, about a mile, or parallel the river around it, about three or four miles, and it has been estimated by the sewer department that the tunnel would be much the cheaper.

It is also planned to reconstruct as a 7-foot sewer the Ferry street sewer, a 6-foot brick sewer which has failed. The Rocky branch sewer, now 12 x 15 feet, is overtaxed, and an auxiliary sewer is to be constructed parallel to it in the next street, ranging from 7 to 9 feet. This is estimated to cost about \$265,000.

RIVER DES PERES SEWER

The River des Peres sewer is the most unusual in some ways that has been undertaken in St. Louis. It is a 9-foot vitrified brick sewer, intended to carry the surface and house drainage from an area of 110 square miles.

At the outlet into the Mississippi River the sewer is carried 14 feet below mean low water, and extends back on a 0.1 per cent grade, so that 14,000 feet will be below low water level in the river. It is estimated that 44,000 feet will at times be under a head, and this length has been constructed accordingly, manholes as well as sewer being adapted to receive pressure. The last pressure manhole is distant from the outlet 26,500 feet, and this distance is calculated to be great enough to build up a sufficient head to overcome the back pressure of the river at all ordinary times. There is no opening of any kind into the sewer between this and 44,000 feet from the river.

No provision is made for a stage of the river higher than danger point, or 33 feet on the gauge, the reason given being that the river never will be above 33 feet for longer than three or four days at a time and at such long intervals as not to warrant the cost of providing for it. The flow line at the outlet is 8 feet below zero on the gauge, making danger point 41 feet above the outlet.

For about 16 miles the River des Peres winds through a low, swampy section just inside the city limits and empties into the Mississippi river just inside the limits at Catalan street. The first three sections of the sewer, about 8 miles in length, will replace 12 miles of river by making short-cuts across "necks" of the river. Besides about 26 square miles of drainage area around the southwest border of the city, inside the city limits, various branches drain about 84 square miles of St. Louis county, outside the city limits. This sewer is designed to carry all the sewage from this area after it is built up, but only sewage, and the open channel of the river will remain undisturbed. Many sewers discharge into the des Peres sewer, including the 12 foot 6 inch Glaise creek sewer. This latter carries Glaise creek in addition to house drainage, but only the latter will go into the des Peres sewer, the overflow of storm water going into the open des Peres river. The same applies with all other district sewers connecting with the des Peres sewer, except one, which is admitted 800 feet from the river in a tumbling basin, the full storm water flow of which will be provided for.

Provision is made for flushing the pressure sewer with water from the River des Peres when the flow is otherwise insufficient. This is accomplished by means of a check valve in a line connecting the sewer with the river. The latter has a minimum flow of 23 cubic feet a second, and when the amount of sewage passing through the sewer does not produce a pressure greater than the pressure of the river water against the valve the latter will open and allow river water to enter the sewer.

The city boundary line makes a gradual curve through an angle of about 40 degrees, and the river approximately follows this curve. The sewer is to follow the river valley, cutting off most of the sharp bends. It starts at the Mississippi river with

a short outfall section, extending for 214 feet into the river. This section has not been started yet, the contractor choosing to wait for a low stage of the river, next fall. The work, of course, will have to be done in a cofferdam, and the expense of such a dam at high water stage of the river would be very great. This part of the sewer and about 500 feet of the tunnel work beyond is to be on an 8 degree curve, bringing the outlet well out in the river and discharging in the direction of the river flow. This is expected to produce a suction and aid the discharge.

The sewer is now under construction in two sections or contracts, one a tunnel section 6,700 feet long, and the other an open cut section of about five miles. The contractors decided to do part of the tunnel section in an open cut and part of the open cut in tunnel work. In the first section three crews are being used, and the contractor on the second section has eight crews at work.

On the first section work was started first in a shaft 980 feet from the edge of the river or about 1100 feet from the gate at the end of the outfall. Another shaft was put down 2,500 feet from the first. Both tunnel crews worked toward the river to the east. The first has finished its work, stopping the tunnel when all but 6 feet of the rock separating the tunnel from the river had been drilled. The second crew, after going 1,300 feet toward the first shaft, struck running sand, which lies between two hills and which is to be worked from the first shaft with a circular shield. Both of these rock tunnels are now being lined.

Work started about the middle of April in the running sand tunnel, worked from the first shaft, and about 100 feet (mostly "nigger head" boulders, gravel and coarse river sand) has now been finished and lined.

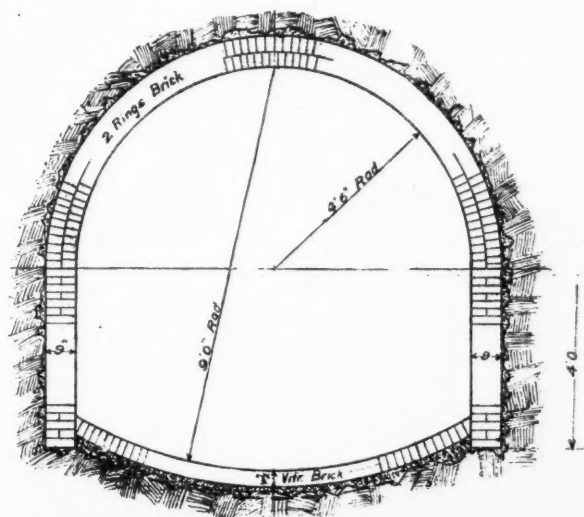
All of the sewer except the running sand tunnel section is

horseshoe shape, constructed of brick. The invert is laid on solid limestone, evened up with concrete. The side walls for a height of 3 feet are 8 inches thick. The upper half is a circular arc, constructed on a center and keyed. The center is of wood, 16 feet long, and consists of four semi-circular ribs well braced. Loose lagging is laid on the ribs as the lining is brought up in horizontal courses from the spring line, and the key course is put in with block lagging in short lengths. All spaces between brick work and rock are filled with concrete.

The lining is laid in Portland cement mortar. All joints are "shoved." The invert and bench walls are built in the morning of each day, the arches in the afternoon and the keying course by the night shift. The longest time the lining stands before the centers are removed is five or six hours after the key course is finished; but since there is no pressure on the lining, barring the concrete filling which is put behind to fill between the lining and the stone, this has proved ample.

Materials, both those for use in construction and that which is excavated, are handled on cars which run on tracks laid in the tunnel. Lifts (cages) raise the cars up the shaft to the surface, where other tracks lead to the dumps and material house.

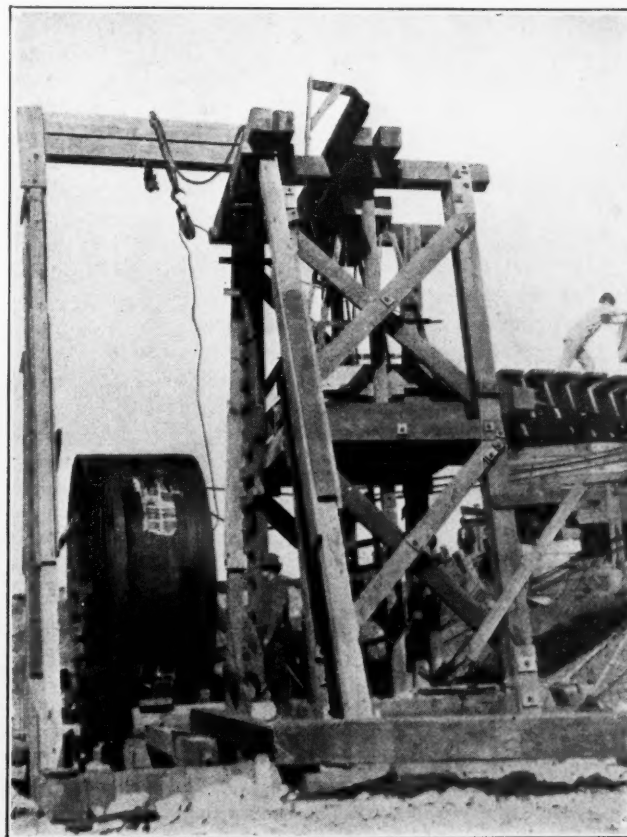
The tunneling is through a good grade of limestone, with a considerable number of mud seams, which are filled with a 1:3:5 concrete mixture. The formation of the rock and earth seems to indicate that at some ancient time the course of the river was along that part of the sewer where the running sand tunnel is, about 1,200 feet from its present channel. Excavation is a little different from ordinary, the whole bore being blasted as a heading, instead of in bench work. Drilling is done in day time and the mucking crew works at night. Smoke and bad air are expelled by opening the cocks on the compressed air line. Compressed air is used for drilling in both the tunnels, and will be used in the working chamber of the quicksand tunnel if it becomes necessary. The air compressor is an Ingersoll-Rand, providing 1,160 cubic feet of free air per minute at 85 pounds pressure. The receiver has about 500 cubic feet capacity and is located just outside the power station. This station is located just off the line of the sewer, midway between the two shafts.



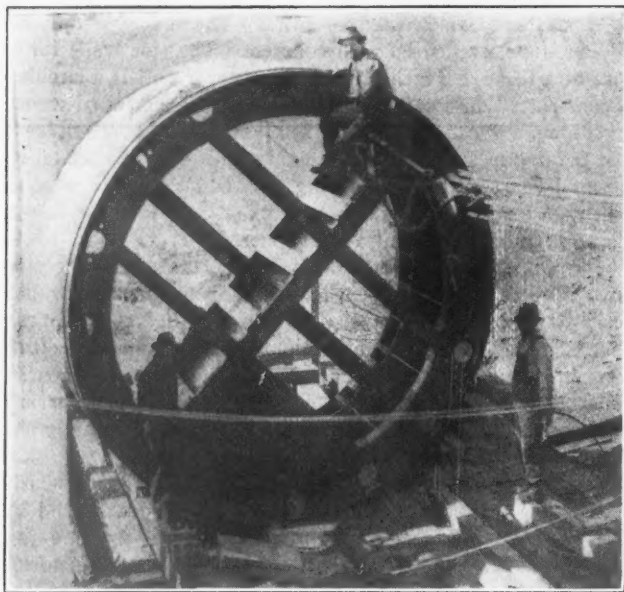
TUNNEL IN COHESIVE GROUND, RIVER DES PERES SEWER



ROCK TUNNEL, RIVER DES PERES SEWER



SIDE VIEW OF SHIELD
Hood and tail are not attached.



REAR VIEW OF SHIELD.

The running sand tunnel, as stated, is the only section of the sewer which is not horseshoe shape. It was made 9-foot circular, as this shape is stronger and much less expensive to construct.

It is being constructed with a steel shield, 13 feet 4 inches outside measurement. The shield is circular, and has two skin plates, $\frac{5}{8}$ inch thick, bolted together the full length (6 feet) of the main shield chamber. One of these plates extends back 4 feet to form the tail and to hold the walls of the tunnel until the lining can be put in. There are two diaphragms, one connected to the cutting edge castings, against which the jacks work, and one to the rear framework of the shield, which supports the circular walls. Sixteen powerful hydraulic jacks, each rated to give 5,000 pounds to the square inch, but tested for 16,000 pounds, rest in the diaphragms. The jacks have a 6-inch plunger and a 30-inch stroke. Two doors of $\frac{5}{8}$ -inch plate steel are provided at the rear of the 6-foot shield to be closed in an emergency, such as the failing of air or a sand run.

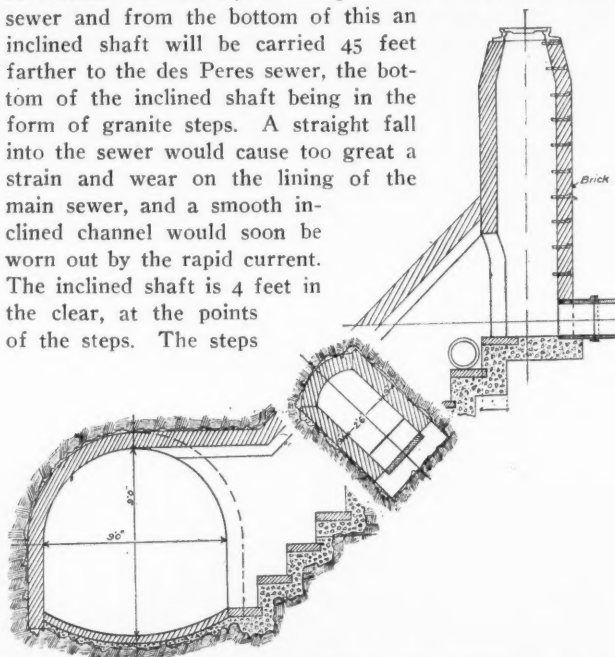
To take the thrust of the jacks when pushing the shield forward, a wood circle is being put in. This is made up of sixteen 30-inch arcs, each cut circular, 6 inches thick and 10 inches wide. One of these cants is put in at a time without removing more than one jack. Under any pressure that has been encountered so far four jacks will propel the shield, but if big boulders or hard formation is struck, the whole sixteen jacks could be used and each could exert its full strength of 16,000 pounds, or a total of more than 100 tons pressure. Similar shields have been used with the jacks working directly against the brick lining, but the wood circle, a fairly good sewer in itself, furnishes a support for the jacks while the brick circle lining is being brought up. The sand closes in and tightens the circle of wood as soon as the tail of the shield moves forward. The wood circle allows half an inch all around for the 18-inch brick lining. This half-inch space is filled with cement mortar, making a close union between the wood and the permanent lining.

After finishing the limestone tunnel east from the second shaft to the running sand, the crew working from the second shaft turned to the west and is now completing a short stretch of 200 feet to connect with the open cut. A third crew has laid a considerable stretch of sewer in open cut westward from the hill.

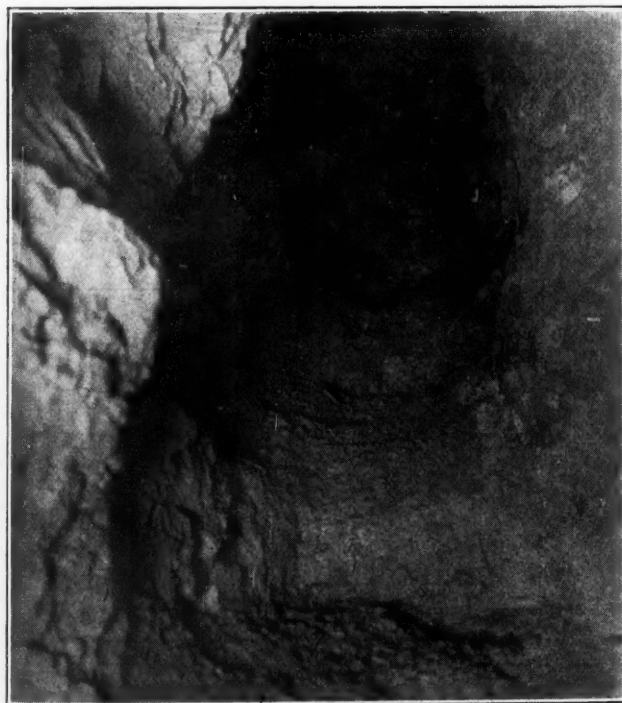
A gate and clean-out shaft, provided for any possible future emergency, is located at the beginning of the open cut, about 4,000 feet from the river, and allows admission to the tunnel without expensive excavation. As the sewer is below low water in the river, another gate will be necessary at the outlet. When both gates are closed this section can be pumped out, permitting any repair or other work.

The gate works perpendicularly in the clean-out shaft and will be nearly balanced with counter weights weighing 3,500 pounds. A windlass will be provided for lifting it. The clean-out shaft is a little over 9 feet across, and is 5 feet 3 inches wide in the direction of the sewer. The total height of the shaft is 38 feet, of which about 8 feet is above the ground. The gate proper is constructed entirely of iron. Two 10-inch I-beams and two 10-inch channels, all vertical, connected by five 5-inch I-beams form the frame work, on which is riveted a $\frac{5}{8}$ -inch iron plate. This gate weighs about 4500 pounds. It slides in grooves built at the west side of the shaft (that farthest from the river) and rises high enough to be entirely clear of the 9-foot sewer. The fit is made as tight as is practicable. When closed the gate can be forced against the seat by long wedges driven into the grooves.

A district sewer is to be connected with the main des Peres sewer through a "tumbling basin" about 800 feet from the river. A vertical manhole 24 feet deep will be built on the district sewer and from the bottom of this an inclined shaft will be carried 45 feet farther to the des Peres sewer, the bottom of the inclined shaft being in the form of granite steps. A straight fall into the sewer would cause too great a strain and wear on the lining of the main sewer, and a smooth inclined channel would soon be worn out by the rapid current. The inclined shaft is 4 feet in the clear, at the points of the steps. The steps



TUMBLING BASIN—LONGITUDINAL AND CROSS-SECTION.



LOOKING UP INTO TUMBLING BASIN, BEFORE PLACING LINING AND STEPS.

have a 20-inch tread and 30-inch rise, the treads being of granite to prevent wear.

Drop manholes on the pressure sewer are provided with a check valve on each branch pipe (the last few feet of which are of iron) opening toward the main sewer. This is intended to prevent the water from backing up into the branch during high water.

In other drop manholes vertical lines of vitrified pipe are fastened by iron straps to the inside walls, and are provided with an elbow at the bottom to throw the outflow into the current of the main sewer and protect the latter from wear.

The second or open cut section of the des Peres sewer is about five miles long and includes all of the 7-foot and the 6-foot portions. This section is now being worked from eight points, and in almost as many different ways. Two cranes, three Potter trench machines, one cableway (at a creek crossing) and a steam shovel are being used on different parts of the job. In addition, one 600-foot stretch is being worked in a tunnel, although it had been planned as open cut work, but as it is through a hill the contractor thought he could construct it to better advantage as a tunnel. Many cave-ins, however, have made the work so difficult and so expensive that it has probably cost the contractor much more than he will get out of it.

This whole second section has proven more difficult than the tunnel. Many expensive accidents have been encountered, one of the first being in open cut where the material was handled by a crane. This crew struck a number of pockets of running sand about 5 feet thick overlying the rock, which latter had to be blasted, and the blasting tended to tear out the sheeting of the trench above. For a portion of the distance it was necessary to construct cross bulkheads ahead of the work above the rock to hold the running sand. Tongued and grooved flooring lumber was used for sheeting and bulkheads.

The shaft for the tunnel section caved in three times during construction and but 10 feet of the tunnel had been completed at the end of four months. The first cave-in occurred when the shaft, constructed 10 foot square, was almost down to the flow line. It was reconstructed 10 by 20 feet, but a quicksand pocket caused it to cave again before it was completed. The third attempt, making the shaft 10 by 27 feet, was successful. The tunnel, which is from 45 to 60 foot below the surface, is entirely in sand, gravel and other loose material. A peculiar formation closely resembling macadam or crushed rock was found in this tunnel, and in some of the open cut work, imbedded in tough gumbo. It ran in layers about 8 feet thick. In March of this year the tunnel caved in 115 feet west of the shaft, the hole extending entirely to the surface, 49 feet above. The tunnel was worked both ways from the shaft, the day crew excavating about 8 feet and bracing it up for the bricklayers at night. No attempt was made to hold the excavation longer than one day. The 600 feet is now about completed, after seven months' work.

As stated, the sewer follows more or less closely the valley of the river, and much of it is in the river bed. Ground water, of course, interfered to a great extent with the work on the whole sewer because of its being below the low water line of the river, but only in quantities which could easily be handled by pumps. In the short stretches constructed in the river's bed, however, not only the ground water, but the river itself had to be contended with. The ground, particularly along the river banks in the swampy bottoms, is of a treacherous nature, and it was very difficult to hold the banks of the excavation. Early in April the river broke through a flume constructed to carry it across the trench, and this stopped the work of the whole crew for several days. The sewer at this point had been almost finished when the mud fill around the flume washed out



END VIEW OF 23-FOOT BADEN SEWER



WHERE RIVER BROKE INTO TRENCH.

and the trench filled with water. Steel sheet piling had been used to hold the banks and the sewer was being laid as fast as the trench was ready and back filled with the excavation from in front. An effort was made to divert the river around the break, over the end of the completed and covered sewer, by drawing the piling at this point; but this was not successful and it was found necessary to practically construct a puddle cofferdam to finish the remaining 40 feet of sewer in the river bed.

Special construction is used in the sewer which lies in the river bed to afford additional strength against the internal pressure should the filling over the sewer be washed away by the river. After the first ring of brick is laid in the invert it is covered with expanded metal in sheets 5 by 28 feet and this reinforcement is carried up over the arch. Two more rings of

brick are laid on this and these two inner rings are carried over the entire arch. Concrete is filled in between the brick arch and the sheeting for 2 or 3 feet above the spring line, making a thick shoulder, and is carried over the outside of the arch about 4 inches thick on top of the reinforcement.

BADEN SEWER.

The Baden sewer, the largest work now under construction, starts from the Mississippi River at the mouth of Gingrass Creek and Moline Creek, two wild little streams which enter the river together. The public sewer is nearly a mile long, ranging in diameter from 18 feet to 38 feet, the latter size being an open channel with vertical sides, 388 feet long, at the outlet into the river. The largest part of the closed sewer is 23 feet wide by 18 feet 6 inches high.

The open section of the sewer is constructed in a 54-foot trench, and has been the most difficult part of the work. It has been completed, as has also about 1,250 feet of the 23-foot closed section. The bed of the combined streams runs along the right of way chosen for the sewer, and the ground was, of course, very wet and hard to hold. Although a considerable part of the finished sewer at this point is above ground, steel sheet-piling was used, driven down to solid rock where the sewer was near the river channel, the piling being needed to hold the banks and prevent washing. Back from the river bank a hundred feet or so the piling did not need to go entirely to rock.

It was found necessary to revet the river bank at the sewer outlet with rip-rap for about two hundred feet to protect the end of the sewer against washing. This connects the revetment made by the government and by the Burlington railroad at the north and south of the sewer outlet.

At the end of the open sewer, just before it connects with the first section of the closed sewer, special provision had to be made for getting under the railroad tracks of the Burlington



COLLAPSE OF SHEETING, 29-FOOT HARLEM CREEK SEWER
Steam Shovel Protected from Earth by Steel Sheeting.

main line, which crossed the double creek on a long wooden trestle. The concrete sewer walls on either side of the tracks are continued to 18 ft. 6 ins. high to act as retaining walls and are strengthened by buttresses 6 feet 3 inches wide at the base and 15 inches to 2 feet thick. Along the top of the retaining walls, which is 15 inches thick, is a reinforced concrete coping 2 x 2½ feet wide. Under the line of the tracks a third wall is built in mid-channel of the sewer, and on these three walls the railroad company purposes to lay concrete slabs 2 feet 9 inches thick, meeting on the middle wall. It also intends to fill in its trestle, when the embankment will form a levee to hold back the two rivers and force them to enter the sewer. A 40-foot opening has been left in the north side of the sewer to admit Moline Creek. On the south side only a two-foot vertical gap was left, Gingrass Creek being turned into the sewer one-fourth mile from the river. This two-foot gap is to admit the storm water which will collect back of the embankment.

The bottom of the open sewer is vitrified brick four inches thick on a 30-inch reinforced concrete base. The first section of the closed sewer is 23 feet wide and 16 feet 9 inches high, with the arch a flat ellipse and the bottom slightly concave. The bottom is constructed similar to that of the open sewer, while the arch is of concrete, 13 inches thick at the crown and 30 inches at the spring line, and reinforced with one-inch round bars one foot apart, making the full curve in one piece, and half-inch bars running lengthwise of the sewer. This section is 2,680 feet long, and has a fall of 0.2 of one per cent.

At 3,150 feet from the river, where the sewer passes under a stone arched bridge carrying the water works conduit, the diameter of the sewer is reduced to 18 feet, which size is continued for 1,440 feet. All of the work in these three sections is contracted to the Hoffman and Hogan Construction Company for \$280,157.15.

From the end of this third section the sewer continues for 4,400 feet with a diameter of 14 feet. This was let to the Wm. F. Reilly Construction Company for \$162,015.80, making the total cost of the public sewer \$442,172.95. Several miles of district sewers to drain the Gingrass water shed, contracted for by the Fruin and Colnon Construction Company, will cost \$434,354.64 more, paid mostly by property owners in the district. This makes the entire project cost over \$875,000.

OTHER SEWERS.

The recently completed Harlem Creek main sewer offered several difficult problems for the contractor. A heavy cut through the edge of a hill resulted in several slides which buried the machinery. The depth of the trench was a little over 50 feet on the hill side of the cut, and a small ravine running through the toe of the hill, together with many layers of saturated clay, made the job very difficult. The excavation was at first made without sheeting, by sloping the banks, but the slope had to extend so far up the hill that it promised to be very expensive, and the contractor thought to save money by using sheet piling. The latter failed to hold the embankment, however, and was crushed in on the machinery by slides, so the contractor went back to slopes, increasing their length, but many cave-ins continued to add greatly to the expense.

The Forest Park sewer, already mentioned as a part of the River des Peres sewer plans, cannot yet be put to its ultimate use, but is being used for a temporary purpose. From its great drainage area the river has collected much sewage and has become an open sewer. Complaint by resident property owners made it necessary last summer to turn large quantities of water into the river from the city water mains, to give it an occasional washing out in dry weather. A temporary electrical pumping plant has been provided to lift the sewage from this Forest Park sewer into an old five-foot sewer, pumping foul water from the river when it is low enough to be polluted by the sewage. Except in the dry months, the flow of water in the river is expected to be sufficient to so dilute the sewage as to prevent a nuisance. When the balance of the River des Peres sewer is completed, the pumping station will be abandoned. The contract cost of the station was \$4,776.

These sewers were designed by Assistant Sewer Commissioner James A. Hooke, under the direction of Sewer Commissioner

Harry R. Fardwell, and with the assistance of the Department Engineer Walter T. Gray. Mr. Gray, who was particularly interested in the planning of the River des Peres sewer, is now Engineer of Construction on the first, or tunnel, section.

CATCH BASINS IN NEWPORT

The street commissioner of Newport, R. I., J. K. Sullivan, in his report for 1909 stated that 587 catch basins—the average number in use during the year—were cleaned a total of 1,583 times; that is each basin was cleaned an average of nearly three times during the year. There were removed from them 1,525 loads of material. The total cost was \$3,253.30, or \$2.06 per cleaning.

Three cleanings per year does not seem to be a very high average, and yet it is very much higher than is found in many and perhaps most cities; the average in Chicago, for instance, being about one-third of a cleaning per year. The number of cleanings which a given basin should receive depends, of course, upon local conditions. Some basins should be cleaned after every storm of any severity, say at least eight or ten times a year; other basins never require cleaning, never receive it and were therefore a waste of money in the first place and worse than useless throughout their existence. It is probable that a number of the Newport basins receive more than three cleanings a year, this being the average of all the basins. And yet it would appear that certain of them should have been cleaned much more frequently, since we find under the statement concerning the cleaning of sewers that 91 tons of gravel were taken from the sewers during the year and used for various purposes by the street and sewer department, yielding a net saving to the department of \$62.79. At points where such quantities of gravel as this are washed into the sewers it would seem as though special basins of unusual size are required. And if the department really makes a net gain by removing gravel from the sewers the greater gain permitted by the cheaper removal from a basin might in a short time suffice to repay the cost of the basin.

ASSOCIATION OF GEORGIA HEALTH BOARDS

At the invitation of the State Board of Health of Georgia there recently convened at Rome, Ga., representatives from many of the cities and counties of the State for the purpose of combining in an effort to improve sanitary conditions throughout the State. An organization was formed which has taken the title of the "Association of State, County and Municipal Health Boards." The officers elected were Dr. J. C. Bloomfield, of Athens, president; Dr. C. M. Weaver, of Macon, vice-president; Alfred V. Wood, of Brunswick, secretary. Meetings of the association will be held on the day preceding the meetings of the State Medical Association. Through its own publications and the use of the public press of the State, the association hopes to exert an influence toward securing the enactment of better health laws and a more effective carrying out of the same.

BOARD OF HEALTH REPORTS

Beginning in the latter part of 1909 the Board of Health of Cincinnati, Ohio, was reorganized, and the first difficulty it encountered was the absence of adequate records or system of collecting them. Experience in New York indicates that there are about three times as many cases of tuberculosis as deaths, and it has been generally found that the cases of typhoid fever average ten times as many as the deaths; but such returns as had been made by the Cincinnati physicians gave a less number of cases than of deaths from such diseases; the reports of tuberculosis cases for the first eight years of the century averaging two or three hundred per year less than the deaths. This condition is being remedied, and any physician who is now found reporting a death from tuberculosis, typhoid, etc., without having previously reported the case when alive is called upon for an explanation.

SEWERAGE STATISTICS OF AMERICAN CITIES

Reports for the Year 1910 from Sixty Large Cities—Furnished Especially for This Table by Officials in Charge—Sewerage Systems—Pumping and Purifying Sewage—Sewer Assessments

Of the 8,428.65 miles of sewers in the cities reporting, 6,385 are combined sewers, and the remainder are on the separate system, 1,250 being for house sewage and 331 for storm water only. (The remaining mileage was unclassified by the informant.) Of the total amount, 5,627 miles are vitrified pipe and 1,808 are brick sewers. Of the remaining 1,000 miles nearly 500 is under the head of "not designated," the majority of which is probably vitrified pipe. Aside from vitrified pipe and brick, the greatest mileage among house sewers is of plain concrete built in place, while combined brick and concrete, cement pipe, reinforced concrete pipe and iron pipe each amounts to two or three miles. Among the combined sewers cement pipe and combination brick and concrete sewers are nearly tied for third place, following which come plain concrete, reinforced concrete built in place, a combination of brick and stone, and stone sewers, in the order named. Among the storm sewers the amount of stone sewer slightly exceeds that of brick, following which come plain concrete, a combination of brick and concrete, reinforced concrete built in place, cement pipe, a combination of brick and stone and reinforced concrete pipe, in the order named.

A great many of these sewers were built several years ago, and a comparison of the relative amounts of each class in this table and those of the sewers built during the last fiscal year would indicate the change in popularity of the several materials; part of this change being probably due to the change in the system as a whole and in the sizes of sewers built, rather than in the materials adopted for given sizes.

SEWERS BUILT DURING 1910.

During the year 1910, or the fiscal year ending during 1910, there was built in the fifty odd cities included in our table 421 miles of sewers. Of these about 117 miles were for house sewage only, and 286 miles were combined sewers, while only 18 miles were for surface water only. All but six of the cities tabulated have a population of more than 25,000. Had a larger percentage of small cities been included, it is probable that the proportion of house sewers to combined sewers would have been much greater, since combined sewers are not so frequently built at the present time in the small cities as is the practice in the larger ones.

The predominance of vitrified pipe sewers in recent construction appears quite strikingly in this table. Of the house sewers 110 miles were built of vitrified pipe, 0.1 of a mile of cement pipe, 3 miles of reinforced concrete pipe, and 1½ miles were built of brick and one mile of plain concrete, these probably being the larger sizes. Even in the combined systems more than one-half of the construction was of vitrified pipe, one-fifth was built of plain concrete and a little less of brick. Of the surface water sewers over one-half were vitrified pipe, about one-sixth were brick, and there was less than one mile each of stone, plain concrete, reinforced concrete, cement pipe and reinforced concrete pipe.

Twelve of the cities did all of their sewer construction by day's labor, nine of these being in New England. Several others did a part—generally a small part—of last year's construction in this way; but the great majority of the work throughout the country was done by contract.

AREA SERVED BY SEWERS

The proportionate amount of the total city area which is served by the sewer system will naturally depend to a large extent upon the amount of sparsely settled area which has been included within the city limits. For instance, that portion of New York City known as the Bronx has extended its sewer system into only about 25 per cent of its area. Two cities re-

port that all of the city area is sewered. Six cities report about three-fourths the area sewered; nine report between two-thirds and three-fourths of the area sewered; thirteen between one-half and two-thirds, eight between one-fourth and one-half, and three less than one-fourth of the area.

HOUSE CONNECTIONS

The majority of the cities use 6-inch house connections only, although quite a number use 4 and others report 8, 9, 10 and even 12-inch connections; although it seems probable that these largest must be for institutions or factories. One peculiarity noticed is that 5-inch connections are used by five New England cities and by only two cities outside of New England. Of 55 cities reporting the sizes used, 25 use 6-inch exclusively, and 19 others use 6-inch and other sizes as well.

It will doubtless surprise some to learn how large a percentage of houses are not connected to the sewers, even in the largest cities. For instance, Chicago contains about 10,000 houses not connected with the sewers and Terre Haute about the same number, or more than three times as many as are connected. A great many of the cities do not report the number of houses not connected, probably because no record has ever been taken of them. An inspection of the table, however, shows that in quite a number of cities only about one-half of the houses are sewered, and only one city, Newark, N. J., reports every house connected with the sewers. Incidentally, it may be said that in the city of New York (complete reports for which do not seem to be available yet) there are a great many thousand houses for which no sewers are provided, some of these in the well-built-up sections of Brooklyn. Most of them, however, are in the outlying sections of the several boroughs other than Manhattan.

Of the cities reporting, about one-third do not use main traps on the house connections. These cities seem to be pretty well scattered over the country, three of them being in New England and three of them in the Middle Atlantic States, while others are found in Colorado, Arkansas and West Virginia. In addition to the fourteen which report that main traps are not used, one reports them as "sometimes" used, another "very seldom," and still another states that their use is optional. Twenty-nine report that main traps are used on the house connections.

HOUSE CONNECTIONS MADE BY WHOM?

In Hartford, Conn., Wilmington, Del.; Springfield, Mass.; Trenton, N. J.; Binghamton, N. Y.; Watertown, N. Y., and Reading, Pa., connections are laid to the curb line by the city and from there on by the property owner. Connections are put in by the city in Rockford and Springfield, Ill.; New Bedford, Newton and North Adams, Mass.; Newark, O., and Erie, Pa. They are put in by the property owner in Little Rock, Ark., Pueblo, Col.; Meriden and New Haven, Conn.; Chicago and Joliet, Ill.; Terre Haute, Ind.; Cedar Rapids and Sioux City, Ia.; Wichita, Kan.; Bangor and Portland, Me.; Haverhill, Lawrence and Lowell, Mass.; Battle Creek, Grand Rapids and Muskegon, Mich.; Butte, Mont.; S. Omaha, Neb.; Elizabeth, N. J. Albany, Buffalo and New York City, N. Y.; Asheville, N. C.; Grand Forks, N. D.; Harrisburg, McKeesport, New Castle Wilkes-Barre, and Williamsport, Pa.; Providence and Woonsocket, R. I.; Aberdeen and Spokane, Wash. Cleveland, O., reports that the city puts in delinquent connections and Columbus, O., that the city makes connections on improved streets and licensed sewer builders on others. We presume that in these cases the cost of the house connection is charged to the property owner; and it seems quite probable that this is also the case in most instances where connections are made by city.

SURFACE WATER INLETS

The majority of the cities report concerning surface water inlets that all of these are provided with catch basins, but still there are a goodly number of cities which have a greater or less percentage of their inlets without catch basins. Wilmington, Del., has 1,700 inlets without catch basins and only 54 with them. Chicago, Ill., on the other hand, has 75,867 inlets with catch basins and none without. (Incidentally, most of Chicago's catch basins are never cleaned out, and so are worse than useless.) Altogether 18 cities report having inlets without catch basins, and 23 that all inlets have catch basins. Two report having no inlets with catch basins, although having a number without catch basins. Altogether the total number of inlets reported having catch basins is about 130,000, and the total without catch basins is about 6,000.

Concerning the cleaning of catch basins, the reports are quite interesting. The number of cleanings vary from practically none to cleaning each basin 100 times a year (twice a week). In the majority of cities, however, the number of cleanings varies from an average of one to six cleanings of each basin a year. In Hartford, Conn., each basin was cleaned an average of four times during the year, and each time there was removed a little less than $\frac{1}{2}$ cubic yard of material. In Chicago the average number of cleanings per basin was $\frac{1}{3}$, and the amount of material taken from each basin was about $1\frac{1}{2}$ yards. A number of cities report cleaning each basin once during the year. Newton, Mass., one of these, removed about 1.9 cubic yards at each cleaning. Buffalo, N. Y., cleaned each basin an average of nearly five times, but removed each time only about one cubic foot of material. In the Borough of the Bronx, New York City, each catch basin was cleaned an average of about twice, and each time there was removed about $2\frac{1}{2}$ cubic yards. In McKeesport, Pa., each basin was cleaned once a month, and $\frac{1}{2}$ a cubic yard removed each time. (The even numbers indicate that these figures were estimated.) In Wheeling, W. Va., each basin was cleaned about six times, and a little more than $\frac{1}{2}$ cubic yard removed each time. In Newark, N. J., each basin was cleaned on an average one and one-half times, and $1\frac{3}{4}$ cubic yards was removed each time.

The ordinary method of cleaning is to use scoops and shovels. Pumps are reported used in Pueblo, Col.; New Bedford, Mass., and Battle Creek, Mich. Pails are used in Bangor, Me.; Chicago, Ill.; New Bedford, Mass.; Newton, Mass.; North Adams, Mass.; Butte, Mont.; Newark, N. J.; New York, McKeesport and Williamsport, Pa. In Providence, R. I., the material is removed in buckets by hand and dumped into steel carts.

In removing catch basin material two cities use iron carts similar to those employed in a number of places for collecting garbage. Two use dump carts, five use dump wagons, and one uses a "water wagon" and a pump. In two or three cities the material is removed from the catch basins to the street, and is collected and carted away by the street department. In two cities the catch basins are cleaned by contract with private parties.

PUMPING SEWAGE

Some details of sewage pumping plants were given by Chicago, Ill., Buffalo and Mt. Vernon, N. Y., Columbus, O., Reading, Pa. and Providence and Woonsocket, R. I. All of these report that the sewage receives no preliminary treatment before being pumped, other than coarse screening; except that at Columbus, O., the heavy detritus is removed and the sewage is passed through 1-inch and $\frac{1}{2}$ -inch bar screens before reaching the pumps. The amount of material so removed in Columbus is not determined. In Reading, about 31 cubic feet of material per million gallons pumped is removed before pumping; and in Providence, about one-tenth of a cubic yard per million gallons.

Centrifugal pumps are used for pumping in Chicago (several plants); in Buffalo, an 18-inch, a 24-inch and a 30-inch pump; in Mt. Vernon, two pumps; in Columbus, two 10-inch pumps, two 12-inch pumps and three 20-inch pumps; in Providence,

two 24-inch pumps and in Woonsocket, one 8-inch pump. The only other style reported is at Reading, where there are two duplex, compound, condensing plunger pumps which lift seven million gallons per 24 hours against a head of 35 feet. Steam is used for driving the pumps in Chicago, Buffalo, five of the seven in Columbus, those in Reading and in Providence. The Mt. Vernon pumps are driven by motors and two of the Columbus pumps by gas engines.

The lifts in the various cities are as follows: Buffalo, 15 feet; Mt. Vernon, 25 feet; Columbus, by gas engines 60 feet, and by steam engines 25 feet; Reading, 35 feet; Providence, 27 feet; Woonsocket, $20\frac{1}{2}$ feet. In Chicago about 3.2 per cent of the sewage is pumped; in Buffalo, 7 per cent; in Mt. Vernon, about 25 per cent; in Reading, 100 per cent; in Providence, about 95 per cent. In each of these cases pumping is necessary for draining certain low lying districts; although in Columbus a large part of the pumping is necessary during the high water only, and in Reading a large part of the lift is to produce the required head on the sewage disposal plant.

MISCELLANEOUS

It is somewhat surprising to note the number of cities which have inverted siphons in their pipe lines. Twenty-one cities so report, Hartford, Conn., having ten; Newton, Mass., five; Buffalo, N. Y., sixteen; Harrisburg, Pa., twelve. Twenty-five years ago considerable doubt was generally entertained as to the successful operation of these, but the number now in use would indicate that any difficulties of construction or maintenance have been met, and are no longer considered as serious. Twenty of the cities report having flush tanks, although a number report having only one. Six report having connections between the water mains and manholes for direct flushing of the sewers.

The data concerning flushing of sewers appear to be very scarce. Chicago reports flushing 625 miles of sewer by hand at a cost of a little under \$50 a mile. Lowell, Mass., flushed 2.2 miles of sewer by hand at a cost of \$121 a mile. Buffalo, N. Y., flushed one mile by hand at a cost of \$41, and Providence, R. I., flushed 20.7 miles by hand at a cost of about \$160 a mile.

In cleaning sewers most of the cities report flushing as one of the methods. Rods are used by ten cities; sewer-cleaning machines by five cities. A number use fire hose for washing the material down, the heavier matter probably being removed at the nearest manhole. Chains are used by some, steel buckets dragged from manhole to manhole, hoes and brushes. Cleaning sewers cost the various cities from \$66 to \$500 a mile, the figure in most cases running about \$200 to \$400 a mile.

Concerning ventilation, most of the cities report the use of perforated manhole covers, while a number include the house stacks or soil pipes as assisting or being the chief agent in this. A number which report that main traps are not used on house connections do not report that the house connections assist in ventilating the sewer, although it would seem probable, if not practically certain, that this is the case.

ASSESSMENT FOR SEWER CONSTRUCTION

State laws, city charters and local conditions, as well as diversified views, cause considerable variation in the methods of assessing for sewer construction. In Little Rock, Ark., the law requires sewers to be constructed by improvement districts, and the assessment is made by districts. In Pueblo, Colo., assessment is on the front foot basis. The same method is employed in Hartford, Conn., for local sewers, while for intercepting sewers an appropriation is made from the general tax fund, and storm water sewers are assessed upon the total watershed. In New Haven, Conn., as assessment is made of \$1.75 per front foot of abutting property; 75 feet on one street is exempted for corner lots and odd-shaped lots are adjusted by the Bureau of Compensation. In Wilmington, Del., there is an assessment of 50 cents per front foot plus one cent per square foot of area on lots abutting on the sewer. In Chicago the en-

(Continued on page 628.)

STATISTICS OF CITY SEWERAGE SYSTEMS

TABLE No. 1—COLLECTION SYSTEM—LENGTH IN MILES OF ALL SEWERS (EXCLUSIVE OF HOUSE AND STREET INLET CONNECTIONS) AT THE CLOSE OF THE YEAR

Name of City.	FOR HOUSE SEWAGE ONLY.											Total.
	Stone.	Brick.	Brick and Concrete.	Brick and Stone.	Concrete, Plain, Built in Place.	Concrete, Reinforced, in Place.	Vitrified Clay Pipe.	Cement or Plain Concrete Pipe.	Reinforced Concrete Pipe.	Iron Pipe.	All Others and not Designated.	
Little Rock, Ark.	68.0	...	...	...	...	68.0
Pueblo, Colo.	86.76	...	...	...	...	86.76
Hartford, Conn.
Meriden, Conn.	...	2.19	...	...	...	...	35+	...	...	1.17	...	38.36
New Haven, Conn.
Wilmington, Del.	10.0	...	...	...	...	10.0
Chicago, Ill.
Decatur, Ill.
Joliet, Ill.
Rockford, Ill.	57.67	...	...	...	...	57.67
Springfield, Ill.
Terre Haute, Ind.
Cedar Rapids, Iowa.	55.86	2.02	...	...	...	57.88
Sioux City, Iowa.	...	0.5	...	...	...	...	44.2	...	...	...	...	44.7
Wichita, Kan.	110.6	110.6
New Orleans, La.	352.39	...	...	...	...	352.39
Bangor, Me.
Portland, Me.	23.48	...	...	...	...	23.48
Cambridge, Mass.	25.76	25.76
Haverhill, Mass.	4.48	...	...	...	...	4.48
Lawrence, Mass.	6.66	...	...	...	...	6.66
Lowell, Mass.	1.19	...	...	...	...	1.19
New Bedford, Mass.
Newton, Mass.	...	10.54	...	...	1.13	...	98.68	...	...	...	...	110.35
North Adams, Mass.	25.91	25.91
Springfield, Mass.	0.2	...	...	...	...	0.20
Grand Rapids, Mich.	16.08	...	...	38	...	16.46
Muskegon, Mich.
Butte, Mont.
South Omaha, Neb.
Elizabeth, N. J.
Newark, N. J.	...	4.19	1.19	...	...	...	60.21	...	...	0.96	...	66.55
Trenton, N. J.	...	2.72	...	...	4.94	...	61.26	...	...	35	...	69.27
Albany, N. Y.
Binghamton, N. Y.	0.20	...	...	...	...	...	0.20
Buffalo, N. Y.
Bronx Borough, New York.	...	1.4	...	...	...	...	34.1	...	...	...	...	35.5
Watertown, N. Y.	6.0	...	2.0	...	...	8.0
Canton, Ohio.62	...	...	...	...	67.15	...	...	...	...	67.77
Cleveland, Ohio.
Columbus, Ohio.
Portland, Ore.
Erie, Pa.
Harrisburg, Pa.
McKeesport, Pa.
Newcastle, Pa.	...	1.0	...	...	...	...	57.98	...	...	...	...	58.98
Reading, Pa.	109.0	109.0
Wilkes-Barre, Pa.
Williamsport, Pa.	...	4.98b	1.38b	...	...	...	33.41	...	...	.09b	...	39.86
Providence, R. I.
Woonsocket, R. I.	...	1.05	...	...	...	...	18.06	...	...	...	...	19.11
Spokane, Wash.
Wheeling, W. Va.
Battle Creek, Mich.	...	5.69	...	...	.156	...	19.51	...	...	.154	...	25.51
Webb City, Mo.	14.15	...	...	...	...	14.15
Asheville, N. C.	40.0	...	...	...	...	40.0
Grand Forks, N. D.
Newark, Ohio.
Aberdeen, Wash.	7.6	...	...	.02	...	7.62
Totals.	...	34.88	2.57	...	6.22	0.20	1,280.08	2.02	2.0	3.12	271.27	1,602.37

Name of City.	FOR HOUSE SEWAGE AND SURFACE WATER.											Total.
	Stone.	Brick.	Brick and Concrete.	Brick and Stone.	Concrete, Plain, Built in Place.	Concrete, Reinforced, Built in Place.	Vitrified Clay Pipe.	Cement or Plain Concrete Pipe.	Reinforced Concrete Pipe.	Iron Pipe.	All Others and not Designated.	
Little Rock, Ark.
Pueblo, Colo.	...	4.47	...	...	...	...	...	...	...	...	...	4.47
Hartford, Conn.	...	56.22	.53	...	3.10	.05	58.05	1.83	...	2.00	.92	122.7
Meriden, Conn.
New Haven, Conn.	...	42.16	.17	.22	.34	.87	59.72	14.73	...	.04	.31	118.56
Wilmington, Del.	...	16.45	...	...	2.43a	...	69.53	...	1.5	.68	...	90.59
Chicago, Ill.	...	641.0	...	...	14.0	...	1219.0	...	...	d	...	1874.0
Decatur, Ill.	...	12.0	...	...	4.5	4.5	113.5	...	...	...	...	134.5
Joliet, Ill.	5.0	...	...	...	...	...	31.0	...	...	...	...	36.0
Rockford, Ill.
Springfield, Ill.	...	40.0	...	...	.13	...	26.0	...	...	...	...	66.13
Terre Haute, Ind.	...	16.3	...	...	...	...	39.7	...	...	...	...	56.0
Cedar Rapids, Iowa.
Sioux City, Iowa.	...	1.08	...	...	...	...	...	...	...	...	...	...
Wichita, Kan.
New Orleans, La.
Bangor, Me.	1.5	20	...	...	...	...	21	...	...	...	...	42.5
Portland, Me.	...	15.90	...	...	...	...	15.01	16.16	...	...	2.98	50.05
Cambridge, Mass.	110.62	110.62
Haverhill, Mass.	...	7.98	.41	...	...	...	30.87	...	...	...	...	39.26
Lawrence, Mass.	...	18.35	1.55	...	...	...	45.67	...	...	...	.20	65.77
Lowell, Mass.	1.16	32.21	...	...	...	...	67.53	...	...	1.55	...	102.45
New Bedford, Mass.
Newton, Mass.
North Adams, Mass.
Springfield, Mass.	...	26.24	.13	...	3.66	...	68.18	24.01	...	...	0.19	122.41
Grand Rapids, Mich.	...	21.67	...	...	10.40	...	114.78	.10	.71	...	...	147.66
Muskegon, Mich.75	...	...	...	...	35.00	...	...	.75	...	36.50
Butte, Mont.	27.0	...	...	...	27.0

a Includes reinforced concrete. b Includes surface water. c Probably includes some house sewers. d Fraction of a mile. e No record. f Brick and vitrified pipe. g Part of this (lengths unknown) are for house sewage only. h No information as to class of sewer.

TABLE No. 1—COLLECTION SYSTEM—LENGTH IN MILES OF ALL SEWERS (EXCLUSIVE OF HOUSE AND STREET CONNECTIONS) AT THE CLOSE OF THE YEAR—Continued

Name of City.	FOR HOUSE SEWAGE AND SURFACE WATER.											Total.
	Stone.	Brick.	Brick and Concrete	Brick and Stone.	Concrete Plain, Built in Place.	Concrete Reinforced, Built in Place.	Vitrified Clay Pipe.	Cement or Plain Concrete Pipe.	Reinforced Concrete Pipe.	Iron Pipe.	All Others and not Designated.	
South Omaha, Neb.	....	.25	....	....	5.0	.25	16.5	....	....	....	....	22.00
Elizabeth, N. J.	....	15.17	....	....	....	....	56.58	....	....	....	....	71.75
Newark, N. J.	0.32	63.47	0.01	....	1.17	....	136.07	....	0.31	0.01	....	201.36
Trenton, N. J.	....	8.25	....	....	.62	....	6.17	....	....	.16	....	15.20
Albany, N. Y.	1.83	16.30	0.37	20.44	0.61	0.11	62.47	0.87	0.11	0.31	....	103.42
Binghamton, N. Y.	....	10.10	....	....	....	....	41.71	....	....	0.30	....	52.11
Buffalo, N. Y.	1.6	163.46	....	4.0	0.94	....	345.74	....	....	1.60	....	517.34
Bronx Borough, New York.	....	55.1	....	....	....	8.2	192.6	....	....	....	....	255.9
Watertown, N. Y.	2.0	2.0	....	....	....	....	27.0	....	....	....	....	31.0
Canton, Ohio.	....	....	....	....	....	....	....	....	....	....	....	....
Cleveland, Ohio.	.25	300.0	....	....	....	12.0	270.0	.25	....	1.50	....	584.0
Columbus, Ohio.	....	81.0	4.3	....	....	....	165.1	....	1.7	....	25.1 ^f	277.2 ^g
Portland, Ore.	....	19.42	....	....	....	6.06	272.46	....	....	....	....	297.94
Erie, Pa.	....	11.43 ^c	....	....	....	1.85 ^c	77.6 ^c	....	....	....	....	90.88
Harrisburg, Pa.	.09	18.0	.15	....	....	3.9	35.1	.44	....	.89	....	58.57
McKeesport, Pa.	....	....	4.34	....	....	....	28.82	....	....	....	....	33.16
Newcastle, Pa.	....	....	....	....	....	....	....	....	....	....	....	....
Reading, Pa.	....	....	....	....	....	....	....	....	....	....	....	....
Wilkes-Barre, Pa.	....	3.6	....	....	....	....	106.1	....	....	....	....	109.7
Williamsport, Pa.	....	....	....	....	....	....	....	....	....	....	....	....
Providence, R. I.	....	....	71.65	....	....	....	151.68	....	....	....	....	223.33
Woonsocket, R. I.	....	....	....	....	....	....	....	....	....	....	....	....
Spokane, Wash.	....	.28	....	....	....	....	91.78	....	.50	....	....	92.56
Wheeling, W. Va.	....	2.5	....	....	....	....	45.7	....	....	....	....	48.2
Battle Creek, Mich.	....	....	....	....	....	....	.41	....	....	....	....	.41
Webb City, Mo.	....	....	....	....	....	....	....	....	....	....	....	....
Asheville, N. C.	....	....	....	....	....	....	....	....	....	....	....	....
Grand Forks, N. D.	....	2.4	....	....	....	....	17.3	1.0	....	....	....	20.7
Newark, O.	....	....	....	....	....	....	....	....	....	....	....	....
Aberdeen, Wash.	....	....	....	....	2.4	....	10.3	....	....	....	....	12.7
Totals.	13.75	1,745.51	83.61	24.66	49.30	38.29	4,188.73	86.39	4.83	9.88	140.32	6,385.27

Name of City.	FOR SURFACE WATER ONLY.											Grand Total.
	Stone.	Brick.	Brick and Concrete	Brick and Stone.	Concrete Plain, Built in Place.	Concrete Reinforced, Built in Place.	Vitrified Clay Pipe.	Cement or Plain Concrete Pipe.	Reinforced Concrete Pipe.	Iron Pipe.	All Others and not Designated.	
Little Rock, Ark.	68.0
Pueblo, Colo.	91.23
Hartford, Conn.	122.7
Meriden, Conn.	38.36
New Haven, Conn.	118.56
Wilmington, Del.	90.59
Chicago, Ill.	10.0	....	....	....	....	1894.0
Decatur, Ill.	134.5
Joliet, Ill.	36.0
Rockford, Ill.09	2.14	....	....	....	....	59.9
Springfield, Ill.	66.13
Terre Haute, Ind.	56.0
Cedar Rapids, Iowa	10.83	....	....	....	....	....	5.83	0.40	....	....	....	17.06
Sioux City, Iowa	4.0	....	....	....	2.0	14.0	....	....	....	....	20.0
Wichita, Kan.	41.1	41.1
New Orleans, La.	352.39
Bangor, Me.	42.5
Portland, Me.	73.53
Cambridge, Mass.	6.64	6.64
Haverhill, Mass.60	....	....	....	....	.64	....	....	....	1.24	44.98
Lawrence, Mass.73	....	....	....	....	.48	....	....	....	1.77	74.20
Lowell, Mass.	1.97	....	....	....	1.97	105.61
New Bedford, Mass.	91.89 ^h
Newton, Mass.	2.89	6.28	....	....	....	....	43.95	....	....	....	....	56.57
North Adams, Mass.	3.45	....	....	....	....	....	....	166.92
Springfield, Mass.	0.4	....	....	7.35	....	7.35
Grand Rapids, Mich.	14.42	....	....	....	....	14.42
Muskegon, Mich.	4.60	....	....	....	....	4.60
Butte, Mont.	1.90	....	.10	.28	4.0	....	....	.80	7.08
South Omaha, Neb.	22.0
Elizabeth, N. J.	71.75
Newark, N. J.	0.06	2.23	....	....	0.70	2.49	2.36	....	1.10	....	....	8.94
Trenton, N. J.	2.17	....	....	1.80	....	7.46	....	....	....	....	11.46
Albany, N. Y.	103.42
Binghamton, N. Y.	55.05
Buffalo, N. Y.	2.50	....	....	....	....	2.74
Bronx Borough, New York	15.9	....	....	....	....	0.3	14.8	....	....	3.3	....	34.3
Watertown, N. Y.	1.5	....	....	....	....	1.5
Canton, Ohio	9.2	....	....	....	....	13.16	....	....	....	....	22.36
Cleveland, Ohio	584.00
Columbus, Ohio	277.2
Portland, Ore.	297.94
Erie, Pa.	90.88
Harrisburg, Pa.	58.57
McKeesport, Pa.	0.10	....	....	....	....	0.10
Newcastle, Pa.	3.0	....	6.34	....	....	....	....	9.34
Reading, Pa.	1.11	3.0	....	....	3.21	....	8.68	....	....	....	....	16.0
Wilkes-Barre, Pa.	125.0
Williamsport, Pa.	109.7
Providence, R. I.	9.27	....	....	....	2.28	....	....	....	8.41	8.41
Woonsocket, R. I.	11.55
Spokane, Wash.	7.5	....	....	....	....	19.11
Wheeling, W. Va.	100.06
Battle Creek, Mich.19	....	....	.53	.11	.95	....	....	....	....	48.2
Webb City, Mo.	1.78	....	27.70
Asheville, N. C.	14.15
Grand Forks, N. D.	40.0
Newark, O.	20.7
Aberdeen, Wash.2	....	2.2	....	....	....	....	18.3 ^h
Totals	30.79	27.80	9.87	1.90	12.89	5.89	168.54	4.40	1.10	.03	67.60	330.81

^a Includes reinforced concrete. ^b Includes surface water. ^c Probably includes some house sewers. ^d Fraction of a mile. ^e No record. ^f Brick and vitrified pipe. ^g Part of this (lengths unknown) are for house sewage only. ^h No information as to class of sewer.

TABLE No. 2—LENGTH IN MILES OF SEWER BUILT DURING FISCAL YEAR (EXCLUSIVE OF HOUSE AND STREET INLET CONNECTIONS)

Name of City.	FOR HOUSE SEWAGE ONLY.							Total.
	Brick.	Concrete Reinforced Built in Place.	Vitrified Clay Pipe.	Cement or Plain Concrete Pipe.	Reinforced Concrete Pipe.	Iron Pipe.	All Others.	
Pueblo, Colo.			2.5					2.5
Hartford, Conn.			.741 M					.741
Meriden, Conn.								
New Haven, Conn.								
Chicago, Ill.								
Decatur, Ill.								
Joliet, Ill.								
Rockford, Ill.			4.22					4.22
Springfield, Ill.								
Cedar Rapids, Iowa.			10.15					10.15
Sioux City, Iowa.			1.2					1.2
Kansas City, Kan.								
Wichita, Kan.			20.6		3.0			23.6
New Orleans, La.			30.77					30.77
Bangor, Me.								
Cambridge, Mass.			2.12 M					2.12
Haverhill, Mass.			.87 M					.87
Lawrence, Mass.			2.16 M					2.16
Lowell, Mass.								
New Bedford, Mass.			1.27 M					1.27
Newton, Mass.			2.53 M					2.53
North Adams, Mass.							0.33	0.33 M
Grand Rapids, Mich.								
Muskegon, Mich.								
Butte, Mont.				.11				.11
South Omaha, Neb.								
Elizabeth, N. J.	1.51		.91					2.42
Newark, N. J.			4.95			0.64		5.59
Trenton, N. J.			4.44					4.44
Albany, N. Y.								
Binghamton, N. Y.								
Buffalo, N. Y.			0.11					0.11
Bronx Borough, New York.			.33 M					1.83
Watertown, N. Y.		1.0	.50					
Cleveland, Ohio.						0.1		0.1
Columbus, Ohio.			6.31					6.31
Portland, Ore.								
Erie, Pa.			1.40					1.40
Harrisburg, Pa.								
McKeesport, Pa.								
New Castle, Pa.			1.03					1.03
Norristown, Pa.			.50					.50
Reading, Pa.								
Wilkes-Barre, Pa.								
Williamsport, Pa.			.472 M					.472 M
Providence, R. I.								
Woonsocket, R. I.			.67 M					.67
Spokane, Wash.								
Wheeling, W. Va.								
Battle Creek, Mich.			2.7 M					2.7
Webb City, Mo.			2.84					2.84
Asheville, N. C.			4. M					4.0
Grand Forks, N. D.								
Newark, Ohio.								
Aberdeen, Wash.								
Total.	1.51	1.0	110.29	.11	3.0	.74	.33	116.98

Name of City.	FOR HOUSE SEWAGE AND SURFACE WATER.									Total.
	Stone.	Brick.	Brick and Concrete.	Brick and Stone.	Concrete, Plain Built in Place.	Concrete, Reinforced Built in Place.	Vitrified Clay Pipe.	Reinforced Concrete Pipe.	Iron Pipe.	
Pueblo, Colo.					1.19	.06	1.29			2.54
Hartford, Conn.										
Meriden, Conn.										
New Haven, Conn.		0.06				0.12	2.44			2.62
Chicago, Ill.		15.1			.26		.16 M			57.22
Decatur, Ill.							41.7			3.5
Joliet, Ill.							3.5			1.0
Rockford, Ill.							1.0			
Springfield, Ill.		1.05			.13 M		2.81			3.90
Cedar Rapids, Iowa.										
Sioux City, Iowa.						0.5				0.5
Kansas City, Kan.										
Wichita, Kan.										
New Orleans, La.										
Bangor, Me.							.60 M			.60
Cambridge, Mass.							.27 M			.27
Haverhill, Mass.							.72 M			.72
Lawrence, Mass.			.26 M				.31			1.99
Lowell, Mass.		0.06 M					2.0 M			2.06
New Bedford, Mass.						.45 M	2.89 M			3.34
Newton, Mass.										
North Adams, Mass.										
Grand Rapids, Mich.					1.23	.037	6.37			7.64
Muskegon, Mich.							5.5 M		.25	6.5
Butte, Mont.							.75			
South Omaha, Neb.					1.0	.25	1.0			2.5
Elizabeth, N. J.							.33			.33
Newark, N. J.							1.62			1.62

M—Work done by municipality. All other was done by contract.

TABLE No. 2—LENGTH IN MILES OF SEWER BUILT DURING FISCAL YEAR (EXCLUSIVE OF HOUSE AND STREET INLET CONNECTIONS)—Continued

Name of City.	FOR HOUSE SEWAGE AND SURFACE WATER.									Total.
	Stone.	Brick.	Brick and Concrete.	Brick and Stone.	Concrete, Plain Built in Place.	Concrete, Reinforced Built in Place.	Vitrified Clay Pipe.	Reinforced Concrete Pipe.	Iron Pipe.	
Trenton, N. J.					0.61		1.54			2.15
Albany, N. Y.							3.00	.08		3.08
Binghamton, N. Y.	1.6	0.46		4.0	.14		9.73		.003	15.94
Bronx Borough, New York.						0.5	7.53			8.03
Watertown, N. Y.										
Cleveland, Ohio.		3.0					14.0			17.0
Columbus, Ohio.							.14			.30
Portland, Ore.		0.1				6.06	103.12	.16		109.28
Erie, Pa.										
Harrisburg, Pa.							1.4			1.4
McKeesport, Pa.										
New Castle, Pa.										
Norristown, Pa.										
Reading, Pa.										
Wilkes-Barre, Pa.		.29					32 M 82			1.43
Williamsport, Pa.										
Providence, R. I.		2.89					2.63			5.52
Woonsocket, R. I.										
Spokane, Wash.							16.27			16.27
Wheeling, W. Va.							1.34			1.34
Battle Creek, Mich.										
Webb City, Mo.										
Asheville, N. C.										
Grand Forks, N. D.		.90					1.51			2.41
Newark, Ohio.							0.5			0.5
Aberdeen, Wash.					1.1		1.4		.005	2.505
Total.	1.6	24.16	.26	4.0	5.66	7.98	241.94	.24	.258	286.09

Name of City.	FOR SURFACE WATER ONLY.									Grand Total.
	Stone.	Brick.	Concrete Plain, Built in Place.	Concrete, Reinforced Built in Place.	Vitrified Clay Pipe.	Cement or Plain Concrete Pipe.	Reinforced Concrete Pipe.	All Others.	Total.	
Pueblo, Colo.										2.5
Hartford, Conn.						0.8			0.8	3.34
Meriden, Conn.										.741
New Haven, Conn.										2.62
Chicago, Ill.										57.22
Decatur, Ill.										3.5
Joliet, Ill.										1.0
Rockford, Ill.				.09	.39 M				.62	4.84
Springfield, Ill.					.14					3.99
Cedar Rapids, Iowa.					0.41 M				0.41	10.56
Sioux City, Iowa.										1.7
Kansas City, Kan.										
Wichita, Kan.		2.0			.5				2.5	26.1
New Orleans, La.										30.77
Bangor, Me.										.60
Cambridge, Mass.		.04 M	.18 M		.09 M				.31	2.70
Haverhill, Mass.										1.59
Lawrence, Mass.					.14				.14	4.29
Lowell, Mass.										2.06
New Bedford, Mass.									.09	4.61
Newton, Mass.					.09 M				.09	2.62
North Adams, Mass.								0.17	0.17 M	0.50
Grand Rapids, Mich.					.72				.72	8.36
Muskegon, Mich.					.16				.16	6.66
Butte, Mont.								.06 M	.06 M	.17
South Omaha, Neb.										2.5
Elizabeth, N. J.										2.75
Newark, N. J.	0.03	0.46	0.58	0.14	0.11		0.21		1.42	8.63
Trenton, N. J.		.10							0.21	4.65
Albany, N. Y.										2.15
Binghamton, N. Y.					1.35		.06		1.41	4.49
Buffalo, N. Y.										15.94
Bronx Borough, New York.	0.3 M			0.23	0.01 M			0.28 M	0.82	8.96
Watertown, N. Y.					.33				.33	2.16
Cleveland, Ohio.										
Columbus, Ohio.										6.81
Portland, Ore.					.20				.20	109.28
Erie, Pa.										1.40
Harrisburg, Pa.										1.4
McKeesport, Pa.					0.10				0.10	0.10
New Castle, Pa.					0.68				0.68	1.71
Norristown, Pa.					.25				.25	
Reading, Pa.					.23 M				.35	.35
Wilkes-Barre, Pa.					.12					1.43
Williamsport, Pa.										.472
Providence, R. I.		.74			.05				.79	6.32
Woonsocket, R. I.										.67
Spokane, Wash.					5.5				5.5	21.77
Wheeling, W. Va.										1.34
Battle Creek, Mich.										2.7
Webb City, Mo.										2.84
Asheville, N. C.										4.
Grand Forks, N. D.										2.41
Newark, Ohio.										0.5
Aberdeen, Wash.										2.505
Total.	.3	2.81	.74	0.90	11.71	0.8	.27	.51	18.04	421.11

M—Work done by municipality. All other was done by contract.

TABLE No. 3—HOUSE CONNECTIONS, INLETS AND APPURTENANCES

HOUSE CONNECTIONS.				NUMBER OF											
City.	MADE DURING YEAR.		TOTAL IN USE.		Number of Houses Not Connected.	Average Cost per Foot.	SIZES OF CONNECTIONS.		Main Traps Used.	Number of Stoppages.	Inverted Siphons.	Manholes.	Lamp Holes.	Flush Tanks.	Flushing Water Main Connections.
	Number.	Feet.	Number.	Miles.			Laid During Year, Inches.	In Use, Inches.							
Little Rock, Ark.	241	10,000	.....	68	3,100	\$.45	4	4	No	45	.....	33	8	130	.....
Pueblo, Col.	245	18,000	.....	.....	.....	.....	4	4	No	.....	.....	.....	.....	None	.....
Hartford, Conn.	256	3,919	.....	.....	.....	.....	6	6	No	3	4	939	79	None	.....
Meriden, Conn.	106	.....	3,328	.....	.....	.....	.....	.....	Yes	a	None	3,500b	.....	None	.....
New Haven, Conn.	503	17,000	.....	.....	.....	.50	5, 6 & 8	5, 6, 8 & 10	Yes	.....	1	1,276	572	10	.....
Wilmington, Del.	915	13,315	.....	36	10,000b	.60	6	6	No	.....	2	68,824	None	20	.....
Chicago, Ill.	11,500	a	290,000b	a	.....	a	6	6	No	20	None	700	None	None	.....
Decatur, Ill.	400	.....	4,600	.....	.....	.25	6	6	No	.....	None	543	360	None	.....
Joliet, Ill.	321	.....	.....	.....	.....	.....	6 & 9	6 & 9	No	.....	.....	.....	.....	None	.....
Rockford, Ill.	362	.....	.....	.....	.....	.....	.....	.....	Yes	120b	.....	a	15	None	.....
Springfield, Ill.	200	a	2,990	a	10,000	.25	6	6	Sometimes	10	.....	686	.....	None	.....
Terre Haute, Ind.	239	a	5,050	76.5	3,000	.60	6	6, 8 & 10	.....	90	2	870	145	145	.....
Cedar Rapids, Iowa.	233	23,440	.....	.....	.....	.35	4	4	Yes	250b	4	1,050	None	None	.....
Sioux City, Iowa.	375	a	.....	110.6	500	.....	4 & 6	4 & 6	.....	249	.....	450	None	137	.....
Wichita, Kan.	718	.....	.....	.....	.....	.....	5	5	Yes	.....	.....	.....	.....	None	.....
Bangor, Me.	75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portland, Me.	a	a	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cambridge, Mass.	191	.....	15,365	.....	.....	.....	6	6	.....	.....	.....	.....	.....	.....	.....
Haverhill, Mass.	200	a	a	a	a	.....	5 & 6	5 & 6	.....	.....	.....	767	.....	None	.....
Lawrence, Mass.	.....	.....	.....	.....	.....	.50	6	6	Yes	106	.....	1,414	a	None	.....
Lowell, Mass.	168	5,000	11,870	.....	620	.....	5 to 8	4 to 12	Yes	46	.....	2,658	.....	None	.....
New Bedford, Mass.	692	24,410	.....	.....	.....	.59	6	6	Yes	337b	.....	.....	.....	.....	.....
Newton, Mass.	212	15,827.17	5,858	76.76	945	.57	5 & 6	All sizes	.....	145	5	3,559	.....	None	.....
North Adams, Mass.	19	500	.....	.....	.....	.33	4 & 6	5 & 6	No	200	1	.....	.....	None	.....
Springfield, Mass.	495	12,400	a	a	a	.40	6	6	Yes	.....	1	.....	.....	None	.....
Grand Rapids, Mich.	1,000	a	.....	.....	.....	a	6 & 8	6	Optional	50b	.....	3,150	250	None	.....
Muskegon, Mich.	80	.....	.....	.....	.....	.....	6	6	.....	.....	.....	.....	.....	.....	.....
Butte, Mont.	172	a	.....	a	.....	1.00	6	6	Yes	20b	.....	354	.....	None	.....
South Omaha, Neb.	56	3,000±	2,500	20	4,000	.40	6	6, 4 & 8	Yes	10	.....	250	.....	None	.....
Elizabeth, N. J.	.....	.....	.....	a	.....	.35	6 & 4	6 & 4	Yes	25b	.....	.....	.....	None	.....
Newark, N. J.	1,563	50,994	44,682	a	None	.82	6	6	Yes	103	2	7,909	a	104	.....
Trenton, N. J.	.....	.....	.....	.....	.....	.....	6	6	Yes	.....	2	1,507	.....	360	.....
Albany, N. Y.	.....	.....	.....	.....	a	a	6	6	Yes	.....	.....	.....	.....	None	.....
Binghamton, N. Y.	200	a	.....	a	.....	.....	6	6	No	20b	.....	842	.....	170	.....
Buffalo, N. Y.	.....	.....	.....	.....	.....	.....	6	6	.....	.....	16	.....	20	.....	.....
New York, Borough of Bronx.	1,443	3,000	28,700	6.9	.....	.60	6	6	Very sald.	27	3	14,312	.....	6	.....
Watertown, N. Y.	50	.....	.....	.....	.....	.....	5 & 6	5 & 6	.....	100	.....	30	.....	.....	.....
Canton, Ohio.	.....	.....	.....	.....	.....	1.05	6	6	.....	332	.....	1,305	.....	205	.....
Columbus, Ohio.	1,489	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Newark, Ohio.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portland, Ore.	.....	.....	.....	.....	.....	.....	6	6	.....	.....	.....	.....	.....	.....	.....
Erie, Pa.	200	3,164	.....	.....	.....	.....	6	6	Yes	a	.....	.....	.....	.....	.....
Harrisburg, Pa.	190	a	a	.....	.....	.39	6	6 & 4	.....	.....	.....	.....	.....	.....	.....
McKeesport, Pa.	74	4,375	.....	41b	2,500	.....	6	4 to 12	Yes	a	12	a	None	None	.....
New Castle, Pa.	500	15,000	.....	.....	.....	.....	6	6 to 12	.....	20	.....	570	300b	185	.....
Norristown, Pa.	361	.....	2,800±	.....	3,000±	1.50	6 to 10	.....	Yes	3	.....	600	.....	225	.....
Reading, Pa.	835	a	6,062	35	.....	.....	5	.....	Yes	.....	.....	1,690	.....	.....	.....
Wilkes-Barre, Pa.	1,311	.....	8,808	.....	.....	a	6	.....	Yes	.....	.....	231	2,083	None	.....
Williamsport, Pa.	.....	.....	.....	.....	.....	.....	6	.....	.....	10 to 15	.....	950b	.....	.....	.....
Providence, R. I.	624	21,412	.....	12.13	.....	.50b	5 & 6	4, 5 & 6	No	121	1	9,695	.....	.....	.....
Woonsocket, R. I.	88	1,279	.....	.....	.....	.....	6	6	Yes	.....	3	.....	.....	.....	.....
Spokane, Wash.	1,500	90,000	6,018	7	.....	.70	6	.....	.....	24	.....	2,429	.....	534	.....
Wheeling, W. Va.	80	2,100	4,000	23	937	.....	4, 6, 8, 12	4, 6, 8, 12	No	73	None	56	42	None	.....
Battle Creek, Mich.	239	10,000	2,000	20	3,000	.85	6 & 8	6 & 10	.....	10	.....	695	35	1	.....
Webb City, Mo.	62	3,700b	321	3.6	.....	1.00	4 & 6	4 & 6	.....	10	.....	170	.....	33	.....
Asheville, N. C.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	825	.....	None	.....
Grand Forks, N. D.	128	a	.....	a	a	.50	6	6	.....	2	.....	316	a	None	.....
Newark, Ohio.	None	.....	.....	.....	.....	.40	6	6 & 4	Yes	.....	1	.....	.....	None	.....
Aberdeen, Wash.	.....	.....	.....	.....	.....	.....	.....	4 & 6	.....	.....	.....	.....	.....	115	.....

a Not recorded. b Estimated. c Not stated whether with or without catch basins. d Included in cleaning catch basins. e Per catch basin. f Cleaned or repaired.

TABLE No. 3—HOUSE CONNECTIONS, INLETS AND APPURTENANCES—Continued

SURFACE WATER INLETS.				FLUSHING BY HAND DURING YEAR.		CLEANING SEWERS DURING YEAR.							
City.	NUMBER.		Number Built During Year.	Number of Cleanings.	Cubic Yards of Material Removed.	Method of Removing Material.	Miles.	Total Cost.	Method.	Number of Miles.	Total Cost.	Sewer Stoppages.	Method of Ventilation.
	With Catch Basins.	Without Catch Basins.											
Little Rock, Ark.	189	.....	.....	Twice a wk.	.....	Pump and shovel.	.....	.....	Rods and brushes, flush tanks and hand flushing.	.....	.....	.....	House stacks.
Pueblo, Col.	2,200	.....	55	8,800	4,000	Scoops.	1.25	.....	Flushing and removing deposit at manholes.	.....	.....	.....	Perforated manhole covers.
Hartford, Conn.	250	.....	93	5,000b	a	Shovel, small cars or trucks for largest sewers.	100	.....	Flushing and by hand.	100b	.....	1	Manhole cover, trap.
Meriden, Conn.	2,570	.....	108	12	.....	Shovel.	.....	.....	Flushing, rodding and by sewer cleaning machine.	.....	\$ 3,775	.....	None.
New Haven, Conn.	54	1,700	.....	.....	.....	Shovel.	.....	.....	Flushing and scraping.	.....	.....	.....	Manholes, by stacks.
Wilmington, Del.	75,867	None	2,197	26,281	40,000b	Shovels, buckets, scoops.	625	\$30,693.75	Flushing with fire hose.	71	31,212.05	a	House drains and soil pipe.
Chicago, Ill.	756c	.....	.....	756	2	Shovel.	2	.....	Rods and hose.	.....	.....	3	Perf. manhole covers.
Decatur, Ill.	1,800b	.....	42	2,400b	.....	Shovel and scoop.	10	.....	Flushing.	.....	.....	.....	Perforated manhole and lamp hole covers.
Joliet, Ill.	219	.....	.....	422	.....	Shovel.	.....	.....	Flushing.	.....	.....	.....	Direct inlet.
Rockford, Ill.	None	a	None	None	None	Scoop.	a	a	Chain.	a	a	None	None
Springfield, Ill.	900	None	50	a	a	.....	.....	.....	Flushing.	.....	.....	2	Stack.
Terre Haute, Ind.	None	None	None	None	None	.....	.....	.....	Flushing.	.....	.....	240	Manhole covers.
Cedar Rapids, Iowa.	1,000	None	100	a	.....	Shovel and scoop	a	.....	Flushing.	.....	.....	.....	Manholes.
Sioux City, Ia.	1,150	None	81	8,000	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wichita, Kan.	1,000	None	28	1,648	.....	Pails.	.....	.....	Scraping and flushing.	.....	.....	.....	.....
Bangor, Me.	1,000	100	31	1,760	.....	.....	.....	.....	By rods and steel buckets dragged between manholes.	a	1,834.46	.....	.....
Portland, Me.	1,255	.....	.....	1,874	2.21 kls. e	Shovels and scoops.	.....	.....	Healey sewer machine.	a	a	.....	Perforated manhole covers and catch basins.
Cambridge, Mass.	.....	None	None	62	a	.....	.....	.....	Scraping with hoes and dragging chain through.	.....	.....	72	Perforated manhole covers and open outlets.
Lawrence, Mass.	1,364	a	93	2,760	a	Shovel.	a	246.78	Flushing.	.....	.....	.....	Through manholes.
Lowell, Mass.	3,578	None	109	All	4,200	Shovel and scoop.	2.2	.....	.....	.....	187.29	.....	.....
New Bedford, Mass.	1,092	740	63	a	3,571	Shovel, pail and pump.	.....	8.34	.....	.....	66.32 per mi.	.....	Perfor. manhole cover.
Newton, Mass.	2,408	Not known	4	2,404	4,568	Shovels and buckets.	.....	140.00	.....	.....	.....	None	Ventilating pipes and perforated manhole covers.
North Adams, Mass.	.....	10	8	1,000	4,000	Shovel and pail.	.....	.....	.....	.....	.....	2	Manhole covers, inlet basins and house drains.
Springfield, Mass.	.....	.....	.....	.....	.....	Shovel and scoop.	.....	.....	Scrapers and flushing.	.....	\$ 2,438	.....	Manhole covers, inlet basins and house drains.
Grand Rapids, Mich.	5,000	.....	125	10,000	a	Shovel.	a	2,439.36	Machines.	a	4,300.92	125	Manhole ventilation.
Muskegon, Mich.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Butte, Mont.	50	158	None	200	a	Shovel and bucket, scoop.	75	a	.....	.....	.....	5	Perfor. manhole covers.
South Omaha, Neb.	200	100	35	150	.....	.....	None	.....	Sewer rods and flushing.	.....	.....	10	Manholes.
Elizabeth, N. J.	.....	.....	.....	.....	.....	.....	.....	.....	Rods, brushes, flushing, pick and shovel.	.....	.....	.....	.....
Newark, N. J.	3,506	None	63	5,227	8,957	Shovel and pail.	.....	d	By hand.	48	16,052.68	.....	Perfor. manhole covers.
Trenton, N. J.	200	600	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Albany, N. Y.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Binghamton, N. Y.	1,342	None	74	1,342	1,100	Scoop.	a	d	Sewer cleaning machine.	1.5	488.40	2	Three manhole tops.
Buffalo, N. Y.	4,927	Few	150	24,418	686	Spoon shovel.	1	41.06	and root cutter combined.	9.5	2,179.85	30	Perforated manhole covers.
New York (Borough of Bronx).	3,829	.....	204	7,525	18,764	Shovel and buckets into carts.	a	a	Shovels and flushing.	150.8	21,469.61	68	Manholes.
Watertown, N. Y.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	Manholes & catch basins.
Canton, Ohio.	660	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Columbus, Ohio.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Newark, Ohio.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portland, Ore.	.....	.....	.....	.....	.....	.....	.....	.....	Rods and fire hose.	.....	.....	.....	.....
Erie, Pa.	.....	.....	.....	.....	.....	Shovel	.....	.....	By hand and stream from fire hydrant.	a	a	a	Perforated manhole covers.
Harrisburg, Pa.	2,040	None	74	10,000b	3,500	Scoops.	.....	.....	.....	.....	.....	.....	.....
McKeesport, Pa.	600	.....	.....	7,200	3,600	Buckets.	.....	.....	.....	.....	.....	.....	.....

a Not recorded. b Estimated. c Not stated whether with or without catch basins. d Included in cleaning catch basins. e Per catch basin. f Cleaned or repaired.

TABLE No. 3—HOUSE CONNECTIONS, INLETS AND APPURTENANCES—Continued

City.	SURFACE WATER INLETS.				FLUSHING BY HAND DURING YEAR.		CLEANING SEWERS DURING YEAR.			
	NUMBER		Number Built During Year.	Number of Cleanings.	Cubic Yards of Material Removed.	Method of Removing Material.	Miles.	Total Cost.	Method.	Number of Miles.
	With Catch Basins.	Without Catch Basins.								
New Castle, Pa.	350	100	10	600	.....	Shovel.	.....	.....	Special appliances.	.....
Norristown, Pa.	.....	.....	.....	660	.....	.....	.....	.....	By cable and buckets	.....
Reading, Pa.	.....	.....	.....	.....	.....	.....	.....	.....	Ropes and brushes.	.....
Wilkes-Barre, Pa.	1,200b	50	15	a	a	Shovel and scoop.	.....	.....	Jointed rods.	.....
Williamsport, Pa.	5,216	1,880	111	7,058	15,411	Buckets lifted by hand into steel carts.	20.7	3,251.40	Scraping with buckets.	.....
Providence, R. I.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Woonsocket, R. I.	2,502c	.....	.....	2,000	2,500	.....	.....	.....	Flushing.	.....
Spokane, Wash.	.....	.....	.....	.....	.....	.....	.....	.....	Endless chain scrapers.	.....
Wheeling, W. Va.	119	180	12	714	360	Shovel and scoop.	5	.....	Hose.	.....
Battle Creek, Mich.	10	20	.....	.....	.....	Shovel, scoop and pump.	200	125	Rods and scoops worked by derrick.	.....
Webb City, Mo.	None	.....	.....	.....	.....	.....	.....	.....	Fire hose connected to fire hydrants. Rods.	.....
Asheville, N. C.	None	6	.....	.....	.....	.....	.....	.....	.....	.....
Grand Forks, N. D.	751c	.....	.....	751	.....	.....	.....	.....	Flushing.	.....
Newark, Ohio.	a	.....	.....	a	.....	.....	.....	a	Sewer cleaning machine.	.....
Aberdeen, Wash.	60c	.....	.....	475	594	Scoop.	.....	.....	Flush tanks equipped with Miller Automatic Siphons.	.....

fire cost of construction is paid by assessment, on the frontage and area basis. In Springfield, Ill., there is a special assessment for laterals and a general assessment for main sewers. In Terre Haute, Ind., all construction is paid for from the general tax levy. In Sioux City, Ia., sanitary sewers are assessed against adjacent property and storm water sewers against the city at large. In Bangor, Me., abutting owners pay three-fourths of the cost and the city at large one-fourth. In Haverhill, Mass., abutting property pays 20 cents per front foot and 0.4 cent per square foot for a depth of 150 feet. In Lawrence, Mass., abutting property pays 6½ mills per square foot for 100 feet back from the street line, and more remote areas pay \$10 per lot of 5,000 feet area. In Lowell, Mass., the city one-half and the abutting property one-half of the total cost. In New Bedford, Mass., trunk sewers are paid for from the general taxes, and the city and the abutting property each pays one-half of the cost of laterals. In Newton, Mass., abutting property pays 15 cents per lineal foot of frontage and 0.55 cent per square foot of drainable area within 180 feet of the street. In North Adams, Mass., an entrance fee is charged for making house connections—\$15 for dwelling houses, \$10 for each tenement and \$10 per tenant for business blocks. In Springfield, Mass., much the same plan has been adopted, but \$25 is charged for a single tenement house and for other buildings one cent per square foot of building area or 1¼ cents per square foot if of more than two stories. In Battle Creek, Mich., the cost is assessed by the front foot, running from 60 cents to \$1 per foot. In Grand Rapids, Mich., a special assessment is made on the district benefited, and this is the practice in Muskegon also. In Butte, Mont., outlet sewers are paid for from the general fund and district sewers by the abutting owners. In South Omaha, Neb., the practice is the same as in Butte. In Elizabeth and Trenton, N. J., the cost of construction and the "benefit" derived therefrom are assessed against abutting property. In Albany, N. Y., the cost is assessed against the entire drainage area. In Binghamton, N. Y., the assessment is 80 cents per lineal foot, 40 cents per lineal foot for corner lots. In Watertown, N. Y., the property benefited is assessed the entire cost for all sewers up to 10 inches in diameter; sewers larger than this are assessed the estimated cost of a 10-inch sewer, the city at large paying the balance. In Asheville, N. C., abutting property pays for the sewer in three annual installments. In Cleveland, O., assessment is by the front foot up to \$2 and anything over this is paid from bonds. In Columbus, O., the assessment is the "benefit to abutting property." In Newark, O., the assessment is by the front foot. In Erie, Pa., the total cost is assessed by the front foot rule. In Harrisburg, Pa., about \$1.25 per front foot is assessed against the abutting property and the balance out of general revenue or loan funds. In Reading, Pa., the sewers are paid for from a general revenue. In Wilkes-Barre, Pa., the sewer is paid for from the general revenue and the city charges \$10 per family for permits. In Providence, R. I., the assessment is 60 cents per front foot and one cent per square foot for 150 feet back, or to the rear of the lot if less than this.

MAINTAINING SEWERS

In the majority of cities there is no special assessment or tax for maintaining sewers, but this is paid for by the city at large, sometimes by a special appropriation but more commonly out of the regular appropriation for the department. In Grand Rapids, Mich., the maintenance is paid out of the ward highway tax. In Williamsport, Pa., the annual charge of \$2.00 per connection is intended, we believe, to cover maintenance as well as interest on the cost of construction.

SEWAGE TREATMENT

Meriden, Conn., has a natural sand area divided into fourteen beds, two of which are used each twenty-four hours, each bed thus being dosed once a week. The beds are cleaned each week before being dosed. The total cost of this plant was \$10,000. The average amount of sewage fed is about 2¾ mil-

(Continued on page 632.)

TABLE No. 4—DEPARTMENT IN CHARGE AND FORCE EMPLOYED

NUMBER OF CITY EMPLOYEES, AVERAGE OF ENTIRE YEAR.																
City.	DEPARTMENT, BUREAU OR OFFICIAL IN CHARGE OF										MECHANICS AND OTHER SKILLED LABORERS.					
	SUPERINTENDENTS		ENGINEERS.		FOREMEN AND INSPECTORS.		TEAMSTERS.		LABORERS, UNSKILLED		ALL OTHERS.					
	No.	Salary.	No.	Salary.	No.	Salary.	No.	Salary.	No.	Salary.	No.	Salary.				
Little Rock, Ark.	{ 1 C 1 M }	{ \$ 150 125 }	1 C 1 M 1 C	{ \$ 50 75 }	1 1/2 C 2 M 1 C					2 M	\$36.00					
Pueblo, Colo.	1 M	1,800	3 C	1,200	1 M 6 C	1,160										
Hartford, Conn.	1 M	1,800	3 C	{ 1,000 to 2,000 }	3 C	4.50										
Meriden, Conn.	1 M	1,800	3 C	2,000	3 C	4.50										
New Haven, Conn.	1 M	1,800	3 C	2,000	3 C	4.50										
Wilmington, Del.	1 M	11.00	1 M	5.00	5 C & M	3.00										
Chicago, Ill.	1 M	11.00	1 M	5.00	43 M	4.00										
Decatur, Ill.	2 a	2,000	17 P	4.13	2	100										
Joliet, Ill.	No regu lar force		employee d.													
Rockford, Ill.	1 C															
Springfield, Ill.	2 M	100	3 C	100	10 C	2.50										
Terre Haute, Ind.	1 M	3.35	2 C	90	{ 8 C 1 M & C 4 C }	{ 60.00 125.00 3.00 }										
Cedar Rapids, Iowa.	1 M & C	1,250			1 M & C	4.00										
Wichita, Kan.					1 M	2.50										
Bangor, Me.					1 M	2.50										
Haverhill, Mass.					1 M	2.50										
Lawrence, Mass.					1 M	2.50										
Lowell, Mass.					1 M	2.50										
Newton, Mass.					1 M	2.50										
North Adams, Mass.					1 M	2.50										
Springfield, Mass.					1 M	2.50										
Grand Rapids, Mich.					1 M	2.50										
Muskegon, Mich.					1 M	2.50										
Butte, Mont.					1 M	2.50										
South Omaha, Neb.					1 M	2.50										
Elizabeth, N. J.					1 M	2.50										
Newark, N. J.					1 M	2.50										
Trenton, N. J.					1 M	2.50										
Albany, N. Y.					1 M	2.50										
Binghamton, N. Y.					1 M	2.50										
Buffalo, N. Y.					1 M	2.50										
Mt. Vernon, N. Y.					1 M	2.50										

C—Means employed on construction; M—Employed on Maintenance; D—Employed at disposal plant; P—Employed at pumping plant. a Includes engineers, b During the season, * Foremen, † Inspectors.

TABLE No. 4—DEPARTMENT IN CHARGE AND FORCE EMPLOYED—Continued

City.	DEPARTMENT, BUREAU OR OFFICIAL IN CHARGE OF		NUMBER OF CITY EMPLOYEES, AVERAGE OF ENTIRE YEAR														
			SUPERINTENDENTS		ENGINEERS.		FOREMEN AND INSPECTORS.		MECHANICS AND OTHER SKILLED LABORERS.		TEAMSTERS.		LABORERS, UNSKILLED		ALL OTHERS.		
			No.	Salary.	No.	Salary.	No.	Salary.	No.	Salary.	No.	Salary.	No.	Salary.	No.	Salary.	
	Construction.	Maintenance.															
New York, Bronx.....	Board of Public Works.....	Board of Public Works.....	{ 1 C 1 M 1 P }	{ 1,500 1,800 1,800 }	3 C 3 M 2 P 4 C	{ 3.00 1,100 to 2,000 }	14 M 3 C 1 M	{ 4.00 3.75 4.50 }	5 M	.....	4 M 20 C 4 M	{ 4.00 4.00 2.00 }	49 M 40 C 20 M	{ 1.75 2.00 2.00 }	4 M	.....
Cleveland, Ohio.....	Dept. of Sewers.....	Dept. of Sewer Maintenance.....	1 C	1,800	1 M	to 2,000	25 C	3.75	.....	.....	2 M	2.00	30	2.00	.....	.....
Columbus, Ohio.....	City Engineer.....	City Engineer.....	1 C	1,500	2 P	80 to 110	2 M	4.50	3 D 11 P	60.00 60 to 100	.....	.....	2 4 P 16 M	2.00 2.00 75.00	2 D	83 to 125
Portland, Ore.....	Eng'r. of Sewers and Bridges.....	Eng'r. of Sewers and Bridges.....	1 C 1 M	1,500	2 C	1,800 to 2,000	25 to 60c	1,200	.....	.....	1 M	75.00	.....	.....	7 C	80 to 125
Erie, Pa.....	City Engineer.....	City Engineer.....	2 M	3.50	1 D	5.00	7 C	3.50	.....	.....	.....	.....	.....	2.00	.....	.....
Harrisburg, Pa.....	Highway Dept.....	Highway Dept.....	1 M	1,200	1 C	2,000	1 M	.....	2 M	.....	1 M	.....	4 4 M	16½ hr.	.....	.....
McKeesport, Pa.....	City Engineer.....	Street Dept.....	1 M	1,000	1 C	45 to 85	.....	2.50 to 3.50	.....	4.50	.....	3.00	.....	2.00	.....	1.50
New Castle, Pa.....	Borough Engineer.....	Borough Engineer.....	1 M	1,000	1 C	45 to 85	.....	2.50 to 3.50	.....	4.50	.....	3.00	.....	2.00	.....	1.50
Norristown, Pa.....	City Engineer.....	City Engineer.....	1 M	1,000	1 C	45 to 85	.....	2.50 to 3.50	.....	4.50	.....	3.00	.....	2.00	.....	1.50
Reading, Pa.....	City Engineer.....	City Engineer.....	1 M	1,000	1 C	45 to 85	.....	2.50 to 3.50	.....	4.50	.....	3.00	.....	2.00	.....	1.50
Wilkes-Barre, Pa.....	City Eng'r and Supt. Sewers.....	City Eng'r and Supt. Sewers.....	1 C	2,000	1 C	1,400	4 C	2.75	5 C	2.00	.....	5.00	15 C	1.65	.....	.....
Williamsport, Pa.....	Dept. of Engineering, City Eng.	Street Commissioner.....	1 C	1,200	1 C	125	2 C	2.50	.....	.....	.....	.....	.....	.....	.....	.....
Providence, R. I.....	Commissioners of Pub. Wks.....	Commissioners of Pub. Wks.....	{ 1 M 1 D 1 P }	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Woonsocket, R. I.....	City Engineer.....	Sewer Commissioners.....	10 a	.....	.....	.....	15	{ 3.25 to 5.00 }	.....	3.50 to 5.00	1	3.25	14	3.00	.....	.....
Spokane, Wash.....	Dept. of Sewers.....	Dept. of Sewers.....	{ 3 C 3 M 1 C }	{ 2.25 1,800 1,800 }	.....	.....	2 C	875	2 Cb	450	1 C	50c hr.	3 C	17½ hr.	.....	.....
Wheeling, W. Va.....	Engineering Dept.....	Engineering Dept.....	1 C	2.25	1 C	1,100	2 C	875	2 Cb	450	2 M 1 to 3 Cb	4.50	15 to 100 Cb	15 to 22c hr.	1 C	55c hr.	
Battle Creek, Mich.....	Board of Public Works.....	Supt. Sewers.....	2 a	960	.....	.....	4	2.25	1	2.50	2	1.85	2	1.75	.....	.....
Webb City, Mo.....	Engineering and Street Dept.....	Sanitary Plumber.....	1 M	100	1 C	.....	2 C	3.00	3 M	1.75	.....	.....	3 M	1.25	.....	.....
Asheville, N. C.....	City Engineer.....	Street Commissioner.....	.....	.....	.....	.....	2 M	.....	.....	.....	1 M	.....	2 M	.....	.....	.....
Grand Forks, N. D.....	Dept. Public Service.....	Dept. Public Service.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Newark, Ohio.....	Engineering Dept.....	Engineering Dept.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aberdeen, Wash.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

—Means employed on construction; M—Employed on maintenance; D—Employed at disposal plant; P—Employed at pumping plant; a Includes engineers; b During the season; * Foremen; † Inspectors.

C—Means employed on construction; M—Employed on maintenance; D—Employed at disposal plant; P—Employed at pumping plant; a Includes engineers; b During the season. * Foremen. † Inspectors.

TABLE No. 5—VOLUME AND DISPOSAL

City.	DAILY DISCHARGE DURING YEAR. GALLONS. TOTAL SEWAGE.			Method of Estimating or Measuring Quantity.	Is Sewage Purified?	Discharges Into	Number of Outlets.
	Average.	Maximum.	Minimum.				
Pueblo, Colo.	.....	.....	.....	.....	No	.....	3
Hartford, Conn.	.....	.....	.....	.....	No	River	9
Meriden, Conn.	2,750,000	.....	2,600,000	Gauged measurements at the out- let at disposal farm.	Yes	River	.....
New Haven, Conn.	3,500,000	4,000,000	3,000,000	Based on water supply	No	Harbor and Sound	9
Chicago, Ill.	480,000,000	537,000,000	423,000,000	From water supplied by pumping ing stations.	No	River	160b
Joliet, Ill.	.....	.....	.....	.....	No	River and creek	40
Rockford, Ill.	.....	.....	.....	.....	.....	River	28
Springfield, Ill.	6,950,000	8,850,000	5,050,000	Current meters.	No	River	9
Terre Haute, Ind.	(a)	(a)	(a)	.....	No	River	10
Cedar Rapids, Iowa.	2,200,000	.....	.....	.....	No	River	3
Sioux City, Iowa.	(a)	.....	.....	.....	No	River	8
Bangor, Me.	.....	.....	.....	.....	No	River	22
Haverhill, Mass.	.....	.....	.....	.....	No	River	35
Lawrence, Mass.	.....	.....	.....	.....	No	River	17
Lowell, Mass.	.....	.....	.....	.....	No	Rivers	32
Newton, Mass.	3,000,000	6,000,000	1,066,000	Weir measurements.	No	Metropolitan sewers	1
North Adams, Mass.	.....	.....	.....	.....	No	River	7
Springfield, Mass.	.....	.....	.....	.....	No	River	11
Battle Creek, Mich.	3,000,000 b	.....	.....	.....	No	.....	15
Grand Rapids, Mich.	(a)	(a)	(a)	.....	No	River	7
Webb City, Mo.	(a)	.....	.....	.....	No	.....	2
Butte, Mont.	(a)	.....	.....	.....	No	Creek	2
Elizabeth, N. J.	.....	.....	.....	.....	No	Rivers	29
Newark, N. J.	.....	.....	.....	.....	No	River and bay	17
Trenton, N. J.	18,000,000	.....	.....	Computed from Kutter's formula.	No	River	1
Binghamton, N. Y.	4,000,000	.....	.....	Weirs in sewer outfalls	No	Rivers	15
Buffalo, N. Y.	130,000,000	180,000,000	110,000,000	.....	No	Rivers and creek	.....
Mt. Vernon, N. Y.	2,000,000 b	.....	.....	Weir at disposal works.	Yes	Creek	1
New York (Bronx)	.....	.....	.....	.....	No	.....	20
Asheville, N. C.	.....	.....	.....	.....	No	River	4
Grand Forks, N. D.	.....	.....	.....	.....	No	River	7
Cleveland, O.	.....	.....	.....	.....	No	Lake and river	.....
Columbus, O.	12,900,000	17,900,000	2,500,000	Venturi meter.	Yes	River	1
Portland, Ore.	.....	.....	.....	.....	No	.....	.....
Harrisburg, Pa.	7,000,000	8,000,000	6,000,000	.....	No	River	36
McKeesport, Pa.	4,742,500	.....	.....	.....	No	Rivers	34
New Castle, Pa.	6,000,000	16,000,000	5,000,000	.....	No	River	2
Norristown, Pa.	.....	.....	.....	.....	No	River	1
Reading, Pa.	4,700,000	.....	.....	Weir measurement.	Yes	River	1
Wilkes-Barre, Pa.	(a)	(a)	(a)	.....	No	River	10
Williamsport, Pa.	.....	.....	.....	.....	No	River	3
Providence, R. I.	19,790,000	50,000,000 b	8,000,000 b	By comparison of pumping records	Yes	Harbor	1
Woonsocket, R. I.	.....	.....	.....	.....	Yes	River	1
Aberdeen, Wash.	.....	.....	.....	.....	No	Rivers	7
Spokane, Wash.	6,250,000	.....	.....	By velocities and depth of flow..	.....	River	10
Wheeling, W. Va.	13,600,000	.....	.....	By water pumped.	No	Creek and river	86

(a) No record.
(b) Estimated.

TABLE No. 6—PUMPING SEWAGE

City.	Is Sewage Clarified Before Pumping?	Kind of Pumping Plant.	Average Static Head.	Gallons Pumped During Year.	Pumping Station Expenses.
Chicago, Ill.	No	Seven plants, various kinds. Modern plants have steam operated submerged centrifugal pumps	Varies in differ- ent Stations.	18,520,000,000	\$67,250.00
Sioux City, Iowa.	No	Two steam centrifugal pumps. Capacity, 3,000 gals. per minute.	15	(a)	.....
Newton, Mass.	No	Two 2½-in. centrifugal pumps operated by two 6-horsepower gasoline engines.	28.75	12,141,322	630.00
Newark, N. J.	Yes	Steam plunger pumps, 30,000,000 gal. per day.	16	5,326,365,684	17,421.68
Buffalo, N. Y.	No	7x3x10-in. vertical compressor, 18-in. suction, centrifugal pump. 8½x17x12-in. vertical compressor, 24-in. suction, centrifugal pump. 10½x20x14-in. vertical compressor, 30-in. suction, centrifugal pump.	15	3,500,000,000	12,047.21
Mt. Vernon, N. Y.	.....	Two centrifugal pumps, motor driven.	25	500,000 gal. per day	.....
Columbus, Ohio.	Yes	East Side Station, gas, two 10-in. centrifugals.	60	.....	5,117.09
Reading, Pa.	No	Main Station, steam, two 12-in. centrifugals, three 20-in. centrifugals. Steam; two duplex, compound condensing plunger pumps. Snow, rated 10,000,000, actual 7,000,000 gal., 24 hrs.	25	.....	19,530.01
Providence, R. I.	No	Three vertical, triple expansion, condensing engines, each running two 24-in. centrifugal pumps, connected by rope drive.	35	1,425,000,000	.....
Woonsocket, R. I.	No	8-in. centrifugal pump.	27 20.5	6,819,000,000	.....

lion gallons a day. All over this amount is treated in overflow beds, about 250 million gallons having been so treated during the past year. The amount of sewage is determined by gauging at the outlet of the sewage farm.

In New Haven, Conn., about 48,000 gallons a day from the almshouse runs into a collecting tank having a capacity of about 8,000 gallons, where it remains for an average period of four hours. The larger particles are caught by a wire basket in a manhole between the buildings and the collecting tank. About six times a day the tank is emptied onto sand filters. The sludge runs onto beds when enough has accumulated to make this advisable. Very little sludge collects, however.

From the collecting tank the sewage flows onto six intermittent sand filters having a combined net area of 21,600 square feet and a depth of $5\frac{1}{2}$ feet. These are artificial beds of sand on crushed stone underdrained. One-half of these beds were built in 1898 and the remaining half in 1910. During the past year an average of 48,000 gallons per day was applied to the beds, the maximum quantity being about 56,000. In dosing, the sewage flows onto each bed for twelve hours, and then is given two and one-half days' rest. Each bed is ordinarily cleaned as soon as it is dried during each resting period.

At Providence, R. I., the sewage is treated by chemical precipitation, which is preceded by screening at the pumping station. There are four large precipitation tanks and sixteen finishing tanks, the total capacity of all of these being 11 million gallons. The average daily quantity of sewage applied was about $19\frac{1}{4}$ million gallons. From these was removed an average of 4,089 gallons of sludge per million gallons of sewage. About 700 pounds of lime were used per million gallons. The effluent is discharged into tide water and the sludge is carried down the bay and dumped into deep water. The cost of chemical treatment was \$23,617.06 or \$3.36 per million gallons. In addition to this the cost of sludge treatment and disposal was \$29,661.92, or about \$4.22 per million gallons of sewage treated.

At Woonsocket, R. I., there are five intermittent filters of sand and screened gravel having a net filtering area of 170,390 square feet, 5 feet deep. The first of these was built in 1898, and extensions have been added at intervals since then. The average daily quantity applied was 730,535 gallons. This flows for about six hours at a dose, each bed being used one day out of five. The beds are raked over every time after having been used.

In Mount Vernon, N. Y., the sewage is first received in five septic tanks, which have a total capacity of $1\frac{1}{2}$ million gallons. Only two or three of these are in use at one time. The average daily quantity of sewage treated was about two million gallons, the average length of time remaining in the tanks about eight hours. About two-thirds of a cubic yard of sludge collected in these tanks per million gallons of sewage. The tanks have not been run long enough to learn how often they will need emptying, but Manager Hammond thinks this will probably be every four to six weeks. The sludge is buried in trenches.

The effluent from the five septic tanks is treated on five sprinkling filters having a total net area of $1\frac{1}{4}$ acres and a depth of about 8 feet. The filtering material is broken stone. This plant was built in 1908 to 1910, the cost of tanks and filters and pumping station being about \$140,000. The sprinkling filters received about 1,800,000 gallons per day on the average, the maximum amount being 2,200,000 gallons. There are about 400 nozzle sprinklers to the acre, which act under a head of 9 feet.

In Reading, Pa., the sewage first passes through a cylindrical screen and then to a settling tank having a capacity of $1\frac{1}{2}$ million gallons. The average amount of sewage treated is four million gallons and the average length of stay in the tank is about nine hours. About 3.22 cubic yards of sludge are produced per million gallons of sewage, and about 50 per cent of the total solids is removed from the sewage by the tanks.

These tanks are emptied every six weeks, and the sludge is pumped into lagoons.

Two sprinkling filters receive the effluent from the settling tank, each of these having a net filtering area of one acre. One of these beds is of broken stone and the other of iron slag, each about 5 feet deep. They were constructed in 1907 and 1908 at a cost of \$35,000 and \$45,000 respectively. The average daily amount of sewage applied to the beds was $2\frac{1}{2}$ millions gallons per acre per day. The effluent passes through settling basins having a capacity of 300,000 gallons. The total cost of maintaining the beds is given as \$3 per day.

The sewage of Columbus, Ohio, is coarse-screened, and then flows through two settling and six septic tanks, the former having a total capacity of eight million gallons and the latter of four million gallons. One-half of these tanks are used at one time. The average quantity of sewage treated per day in 1910 was 12.9 million gallons, and the average length of stay in the tanks was seven hours. About 0.55 ton of sludge was produced per million gallons of sewage, and 62 per cent of the total solids was removed from the sewage. These tanks were emptied five times during 1910 during flood stages of the river, the sludge being discharged into the river and disposed of by dilution. The cost of these tanks was \$66,730.

There are four sprinkling filters, each being an equilateral triangle in shape, having a total net filtering area of 10 acres, $5\frac{1}{2}$ feet deep. The filtering material is crushed limestone. These beds were constructed in 1907 and 1908 at a cost of \$240,000. During 1910 they received an average daily quantity of 1.46 million gallons per acre, the maximum amount being $2\frac{1}{2}$ million gallons per acre. The sewage is applied through sprinklers, the head being from 6 to 8 feet, having been uniform most of the time, although it may be varied up to 10 feet. The final effluent is settled in two basins 4 feet deep, each with a capacity of two million gallons.

DISPOSAL OF NIGHT SOIL

This is in charge of the Board or Department of Health in Wilmington, Del.; Chicago, Ill.; Terre Haute, Ind.; Cedar Rapids, Ia.; Lowell, Mass.; Grand Rapids, Mich.; Butte, Mont.; Reading, Pa.; Providence, R. I., and Wheeling, W. Va. In Battle Creek, Mich., it is in charge of the Board of Public Works; in South Omaha, Neb., of the garbage master, and in Asheville, N. C., of the sanitary inspector. The other cities made no report concerning this. In the majority of cities the removal is done by parties employed by the house holder; the exceptions being Asheville, where all is removed by the city once in two weeks; South Omaha, where about one-third of it is removed by the city an average of once in six months; Grand Rapids, where all is removed by this city; Battle Creek, where it was removed last year from 180 premises an average of once every two weeks, and Cedar Rapids, where about 4 per cent was removed by the city last year.

The city destroys this material in garbage crematories or incinerators in Wheeling, McKeesport and Terre Haute. In McKeesport the city charges 15 cents per barrel for incinerating it. The cost in Terre Haute is given as 50 cents per ton. In South Omaha the city disposes of that which it collects by dumping it into the river. In Butte it is buried in trenches at the city dump. In Grand Rapids it is disposed of on the dumping grounds, the house holder being charged 50 cents per barrel for removal; this city removed and disposed of 21,523 barrels last year. In Battle Creek the city removed about ten tons, which it disposed of on farms as fertilizer. The same use is made of it by private collectors in Lowell. In Cedar Rapids both the 800 cubic feet collected by the city last year and the 21,000 cubic feet by private contractors were dumped into the river. The charge made to the house holder was 10 cents per cubic foot. In Chicago the material is deposited in the public sewers by scavengers, for which they are charged 10 cents per cubic foot. Night soil was removed from about 10,000 premises in this city last year. In Wilmington about 74,000 cubic feet of material was hauled to pits. The house holder is charged 10 cents per cubic foot for the service.

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MAY 3, 1911.

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Control of Garbage Disposal

In the abstract on another page of a paper by Professor Jordan the opinion is expressed that a municipal Board of Health should not be burdened with and have its funds diverted to the removal of garbage, which, in the author's opinion, is not a matter of sanitation, but merely one of municipal house-keeping. There are other very cogent reasons why this service, and the related one of ash and rubbish removal, should not be in the hands of the Board of Health. In the popular mind, and rightly we believe, members of the medical profession are considered best fitted for positions on the Boards of Health; but medical men are not often experienced in such practical

matters as the maintaining of large forces of men and teams such as are required for this work, nor in the mechanical engineering involved in the destruction of refuse by incineration or of garbage by utilization plants. We believe that the great advance in the disposal of garbage which has taken place during the past few years has, to a large extent, been due to the placing of the control of this in the hands of the city engineer or of a consulting engineer making a specialty of this work, rather than in those of the Health Department, as was formerly the practice.

This does not mean that the odors and general nuisance too often created by garbage and ashes are of no importance, but rather that it is a matter which should be controlled by the general police power of the city and remedied by the experience of practical men rather than of physicians on Health Boards.

Essentials of Sewage Purification

The essential features of tank and filter purification of sewage (which includes practically all methods other than sterilization), are the removal of polluting matters in suspension and in some cases an appreciable proportion of those in solution; the modification in the tank or filter of the matters so removed, and the removal of this matter either by the automatic action of the filter itself or by withdrawing it through valves, by pumps, etc. The effects produced by the filter may be divided into two general heads, that produced upon the effluent and the character of the matter voided or removed.

In a settling tank the suspended matter is removed by sedimentation, occasionally assisted by chemicals. In the fine grain filter the removal is largely effected by straining action. In coarse grain filters, such as sprinkling filters and contact beds, the removal is due partly to straining but mostly by surface adhesion to the filter particles and partly by sedimentation upon their top surfaces. In slate beds the last named is the principal form of removal.

The action of bacteria and other vegetable and animal life, together with a certain amount of oxidation and other chemical change, may produce a considerable modification in the character and form of the matter retained in the bed or filter. In fine sand filters there seem to be few living agents other than bacteria acting to produce this result. In coarse grain filters and slate beds, however, larvæ (as of the moth fly found in the Philadelphia experiments described elsewhere in this issue), earth worms and other animal life of the lowest forms; algae of various kinds and bacterial jelly all play their part in changing the organic matter removed into that having many of the characteristics of loam rich in organic matter, and little if any more objectionable to the senses. In the sedimentation tank there is little change in the matter deposited, except that due to septic action which takes place in the so-called septic tank. The latter gives a sludge less slimy and otherwise objectionable and easier to handle than fresh sludge; while that which has been worked over in the Emscher tank seems to have been reduced still further and to approximate in its nature the humous-like material found in slate beds. The matter strained out by the fine grained filter usually remains upon or very near the surface and when dried frequently resembles the dry, flaky cakes which form on wet clay when exposed to a hot sun. The organic matter from a sprinkling filter bears more resemblance to dry leaves, although thicker, being compared to leather by some.

This question of the character of the matter removed from the filter is a very important one in relation to the disposition which is to be made of it; and this disposition is one of the most important and difficult questions now confronting the designer and operator of sewage disposal plants. The humous or leathery matter from slate beds, Emscher tanks and sprinkling filters does not present nearly so many difficulties in its final disposal as the slimy liquid mass removed from precipitation tanks, or the somewhat less objectionable material from the septic tank.

Of only less importance in this connection are the methods

which must be employed for removing this matter from the tank or filter. As stated, it remains almost entirely upon the surface of fine grain filters and is easily removed by spades. That which collects in slate beds is usually flushed out by hose or other vigorous streams of water. Deposits in the sprinkling filters usually dislodge automatically at intervals and can be collected from the effluent in a settling basin with little difficulty or inconvenience. The sludge from settling and septic tanks is usually either pumped out or drawn onto beds by gravity. Probably the most difficult of all is the removal of this matter from contact beds, since it seems to be generally necessary to remove all the filter media from the beds and clean them by hose or otherwise.

In the past, most of the attention of investigators was paid to the character of the effluent obtained, and not enough to the difficulties of removing and disposing of the solid matters which collect in the plant. It is possible that this is to some extent responsible for the too general tendency of those who are placed in charge of the sewage treatment plants to fail to keep them up to a proper working condition; and it is hoped that with the study of this feature of the maintenance of such plants and the progress which is being made in removing or ameliorating the difficulties, together with an appreciation of the importance of proper maintenance and the employment of a higher grade of superintendents for this purpose, the actual operation of sewage disposal plants in this country will in the future more nearly approximate the intentions and promises of the designers.

For Better Sewerage Construction

In most branches of municipal and other construction there has been a great improvement in recent years in the materials and methods used and in minor details looking to greater perfection. Public funds have been appropriated and talent of a high order has been devoted toward working out better methods of sewage treatment, and more recently of disposal of sewage by dilution. But there appears to have been little change made in the collecting system for either house or storm water, as to either the main conduits or the appurtenances, if we except the adaptation of reinforced concrete to the former.

It may be said in extenuation of this that the materials which have been used for years are as satisfactory as can be expected, and that no change is necessary, and in a general way there is much truth in this. On the other hand, there frequently occur conditions where the sewer conduit requires special construction but does not often receive it; such as wet ground, where water-tightness is desirable.

The sewer conduit is buried beneath the surface of the street, and generally deeper and more inaccessible than any other sub-surface structure. It is therefore a matter of only ordinary economy and common sense to make sure that the materials and methods of construction are such as to obviate any future necessity for repairs due to a breaking of the sewer because of weakness, to gradual disintegration of the material or to wearing out of the invert. These practical precautions are as important as designing adequate capacity or securing sufficient, uniform grade to prevent deposits. Because of the difficulty of rectifying errors and because of the great importance to the health and convenience of the citizens of the uninterrupted serviceability of a sewerage system, there is, perhaps, no place where experimenting with doubtful materials or methods is more out of place or likely to prove more disastrous.

Unfortunately there seems to be an impression in the minds of many city officials and even engineers that, because there are available for sewer conduits for ordinary conditions comparatively cheap materials which are sufficiently serviceable, no conditions justify any great expense for sewer conduits. No one complains against the cost of iron pipe for water mains, which is much more expensive than the cost of the vitrified sewer pipe for removing this same water through a

house sewerage system; but should the presence of a large amount of ground water make it desirable to secure an impervious conduit there is great hesitancy and frequently absolute refusal to spend a few cents a foot additional in securing tight joints; although there is no question that it is possible to make perfectly tight sewer joints, nor that the failure to do so threatens the pollution of soil and ground water with sewage and adds greatly to the expense required for treating sewage; this latter point being especially likely to be overlooked when treatment is not immediately necessary.

Concerning the appurtenances of sewerage systems there seems to be even more necessity for more thoughtful consideration of the requirements and adaptation of the means to the end. We have frequently referred to the fact that catch basins are used in connection with surface water inlets more commonly than is necessary, and further argument in support of this is given in the statistics printed in this issue; these showing that most of the basins in the sixty cities reporting are not cleaned oftener than once or twice a year, and a considerable percentage of them are apparently never cleaned at all. Chicago reported 26,281 basin cleanings last year, the total number of basins being nearly 76,000. A basin is of little service if not cleaned at least three or four times a year; consequently, not more than 8,000 basins are giving real service in Chicago, and about 68,000 have been built in Chicago which are unnecessary, or at least are giving no returns; and if we assume these to cost but \$25 each (additional to the cost of a plain inlet) we have an expenditure of \$1,700,000 which was not only unnecessary but (since an uncleaned basin is a collector of filth and a disseminator of odors) is actually detrimental. We select Chicago as an illustration not because it is exceptional but because it is one of the few large cities which have the highly commendable habit of collecting statistics concerning the operation of its sewerage system. In another article we refer to the design of surface water inlets and to the fact that there are, perhaps, no more absurd and ineffective devices used by the Borough of Manhattan than its inlet openings.

To mention only one other appurtenance of the sewerage system which would seem to merit more attention than it has received, the ordinary method of making house connections or of locating the branch pipes for such connections appears to need improvement. Not much concerning this reaches the public print, but we know that in scores of cities it is impossible to find house connections a few years after the sewer has been constructed; or, at least, they are not found, and plumbers make more or less successful attempts at breaking open the sewer and connecting the house drain therewith, frequently producing a cracked pipe, a leaky joint and a deposit of cement in the bottom of the sewer and projecting drain pipe which form obstructions to the flow.

Modern science has made great progress in improving upon the older methods of sewage disposal, garbage disposal and other kindred problems. The questions connected with the sewer conduit are not as pressing, perhaps, but such as they are they are of even greater importance and should receive equally wise and careful attention. In no municipal structure is it truer that "the best is none too good."

UNDERGROUND STORM SEWER OUTLET

All the storm and waste water of a considerable area of the City of Reading, Pa., which is collected by sewers, was designed to discharge into a well at a street intersection, at the bottom of which was a seam in the underlying rock into which the water disappeared for three years after the construction of the well. A few months ago this well caved in, the dirt filling up the crevices so that they refused to take the water any longer. Efforts to locate other wells so as to avail of similar crevices proved unsuccessful, and the only solution was to construct a sewer to discharge into the river. We have previously referred to similar instances in other cities, but they are sufficiently unusual to make them of some interest.

SPRINKLING FILTER EXPERIMENTS

At Philadelphia Experiment Station—Various Kinds and Sizes of Media—Growths On and In Filter Beds—Effect of Ventilation—Clogging and Unloading—Hypochloride as Cure for Clogging

AMONG the experiments in sewage purification conducted at the Philadelphia sewage experiment station, those upon sprinkling or percolating filters received the most attention. Fourteen sprinkling filters were operated, a battery of six being out of doors, and two large ones, a battery of five small ones and a Hamburg filter, being inside the building.

The six outside filters each had an area of 0.002 acre, and were arranged in three pairs, each pair forming a square in the center of which was a Columbus nozzle. These filters contained the following filtering media: No. 1, seven feet of $\frac{3}{4}$ -inch to 3-inch limestone; No. 2, eight feet of $2\frac{1}{4}$ -inch to 4-inch limestone; No. 3, five feet of 1-inch to 3-inch slag; No. 4, six feet of 1-inch to 3-inch trap; No. 5, three feet three inches of $\frac{1}{2}$ -inch to $2\frac{1}{2}$ -inch gravel, during the first part of the experiments, and the same depth of $1\frac{1}{2}$ -inch to 3-inch trap during the second half; No. 6, four feet three inches of $\frac{1}{2}$ -inch to $2\frac{1}{2}$ -inch trap. The filters were built on a concrete foundation, the floor of each sloping so as to concentrate the effluent at the outlet. Wooden posts and planking form the sides of and partitions between the units.

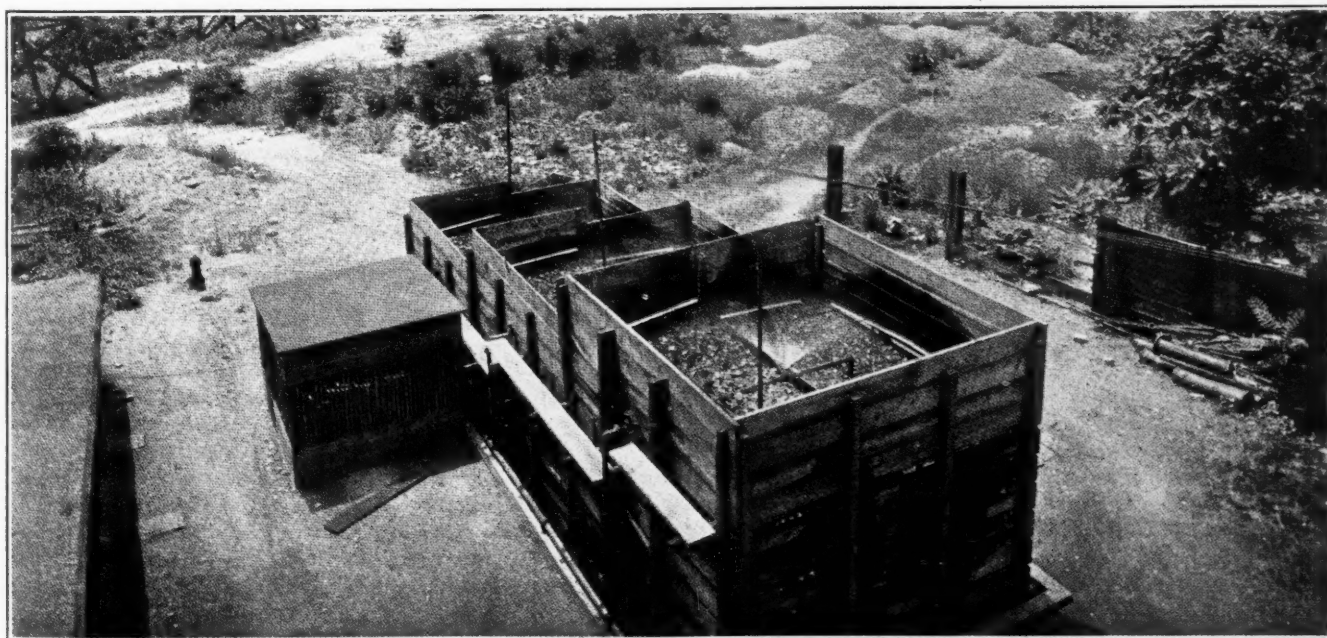
These filters received a sewage which had been roughly settled in a wooden tank, from which it flowed under a constant head through a 3-inch pipe to a dosing tank. This consisted of a cylindrical wooden tank, the inlet of which was controlled by a float valve and the outlet by a shear valve, both of which were operated by a float and weighted lever in such a way that the tank was alternately filled and automatically emptied. The bottom was given the approximate form of a frustum of an inverted cone, by bricks placed in the bottom of the tank; the object of this being to improve the uniformity of distribution upon the beds.

Of the two large indoor filters, one was 0.01175 acre in area and six feet deep above the underdrains, the filtering medium being hard clinker rejected by a $\frac{1}{2}$ -inch screen, the underdrains being formed of slabs of old concrete pavement. Taylor square nozzles were used during the first part of the test, and Reading nozzles during the latter part. The sewage applied was previously screened through $\frac{1}{2}$ -inch and $\frac{1}{4}$ -inch screens. A constant head was maintained in the dosing tank. An undulating

head upon the nozzles was obtained by a butterfly valve in the pipe line, the lever of which was controlled by a cam which was revolved by an over-shot water wheel. The other of the two large filters contained 6 feet 6 inches of hard stone, broken by hand into sizes ranging from $\frac{3}{4}$ inch to $1\frac{1}{2}$ inches. The drains were composed of 6-inch split vitrified pipe, with lugs on the edges. Over the central main drain 12-inch by 24-inch slates were laid, and on them three 4-inch vitrified pipes perforated by $\frac{1}{4}$ -inch holes were stood in a vertical position as ventilators, and other ventilators were placed along the sides composed of the underdrain tile. At three feet depth these ventilating pipes were connected together by horizontal 3-inch perforated pipes. The vertical ventilators extended to the surface of the filter material, where circular terra cotta caps were cemented on. This ventilating system connected at one corner to a 6-inch galvanized iron chimney, upon whose top was a cowl so arranged as to always produce an upward draft, with the intention of always drawing air from above the surface of the filter down through the ventilating system. The main drain was trapped at the outlet to prevent air entering there. Two Taylor nozzles were used, and an undulating head upon them was obtained in the same way as in the case of the other filter. The cam for this filter, however, was so designed that the nozzle was playing almost the entire time.

To study the effect of the nature of the filtering material upon the results, a battery of five small filters was used, these containing common marbles (spheres), gravel (spheroids), broken trap (irregular), broken slag (irregular), and broken coke (irregular), which had passed a $\frac{5}{8}$ -inch screen and been rejected by $\frac{1}{2}$ -inch. These were placed on a false floor of $\frac{1}{4}$ -inch mesh wire screen. Each of these small filters was dosed from a tipping tray.

The so-called Hamburg filter was constructed in a wooden tank of eight square feet area. The bottom was of sloping concrete, upon which was placed 2 feet 4 inches of clinkers, ranging in size from "fist to child's head," the spaces between the top layer being filled with $1\frac{1}{8}$ -inch clinker. On this was placed a distributing medium, a 4-inch layer of $\frac{3}{8}$ -inch to $1\frac{1}{8}$ -inch clinker, and on this 4 inches of $\frac{1}{4}$ to $\frac{3}{8}$ -inch coke and



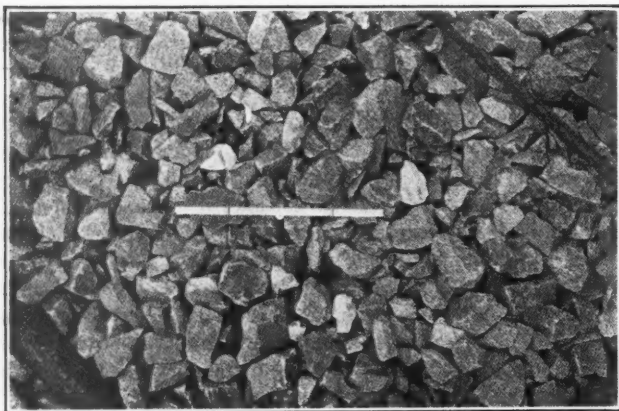
OUTSIDE SPRINKLING FILTERS, PHILADELPHIA SEWAGE EXPERIMENT STATION

14 inches of 1-25 to $\frac{1}{8}$ -inch coke. One-inch holes were bored around the tank below the distributing layers to furnish ventilation, and this was also secured through the effluent openings.

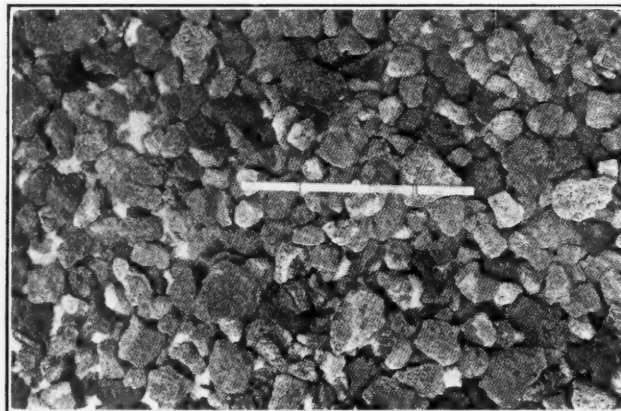
In general the rate on the outside filters was approximately one million gallons per acre per day. During the winter the rate was slightly increased, not by applying more sewage in a given time, but by the reduction of the area in service caused by the formation of ice in the corners of the filter. The tests generally seemed to show that, neglecting other factors, the maximum rate at which a filter can be economically operated is in inverse proportion to the amount of suspended solids applied. Owing either to the better underdrainage system or to the ventilating system, or both, the lower of the two inside filters,

avored the retention of both solids and bacterial jelly to such an extent as to make it very difficult to prevent clogging, and the unloading of the digested solids was less readily effected also.

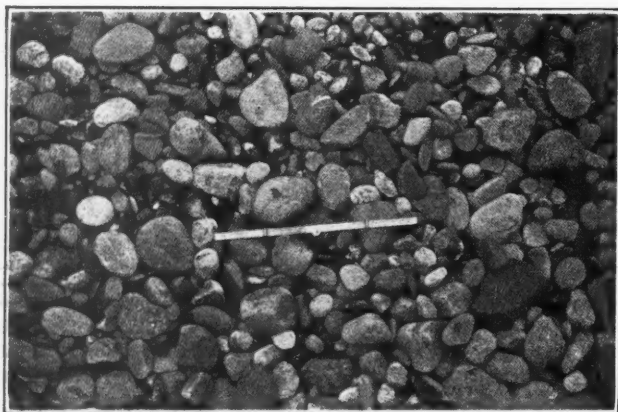
During these tests the size of limestone particles was reduced to a considerable degree by either a breaking down or dissolving of the limestone. To a certain extent the slag particles were also reduced in size. The trap rock showed very little change. Approximately the limestone in bed No. 1 changed from an average of 2 inches to an average of $1\frac{1}{2}$ inches, and that in bed No. 2 from an average of $3\frac{3}{4}$ inches to an average of $2\frac{1}{4}$. The slag in No. 3 changed from an average of $2\frac{3}{4}$ inches to an average of $1\frac{1}{2}$.



$\frac{1}{2}$ -INCH TO $2\frac{1}{2}$ -INCH TRAP.



ONE-INCH TO 3-INCH SLAG.



$\frac{1}{2}$ -INCH TO $2\frac{1}{2}$ -INCH GRAVEL.



$2\frac{1}{2}$ -INCH TO 4-INCH LIMESTONE.

MEDIA USED FOR SPRINKLING FILTERS.—SCALE ABOUT ONE TO TEN.

although operated at a higher rate than the outside filters, produced a better effluent. This result was also probably assisted by a better protection from the weather, the more perfect distribution and better preparation of the applied sewage.

All observations tended to show that biological action is most efficient when regular, and that the sprinkling filters gave the best results when the sewage was applied continuously at a uniform rate over the entire area. This was found impossible of attainment with a fixed head on the nozzles, but was quite closely approximated by the use of the falling head, and especially by the undulating nozzle pressure described above. With this cam in service, although the spray alternately approached and receded from the nozzle, thus giving brief periods of rest to each part of the filter, and the volume discharged varied with the head, this occurred at such short intervals that the effluent left the filter at a practically constant rate, the pimple formed by the hook gauge at the weir used for measuring the effluent varying so little that it was impracticable to read the fluctuation.

A comparison of the various media showed that the smooth, rounded gravel did not retain a growth of bacterial jelly as well as did the limestone and trap, did not remove the impurities as effectively, and was generally less desirable. At the other extreme was the slag, which, with its rough, porous surface,

A peculiarity of the slag was the growth, upon the surface of the bed, of algae, known as cyanophyceae-oscillaria. A similar growth of algae had been found to take place on a slag bed at Reading, Pa. Another peculiarity of the slag was the fact that it apparently retained heat longer than the other media, or else created heat by some internal action; this being indicated by the fact that the slag bed resisted the formation of ice upon its surface much longer than the others.

As we have had occasion to suggest in a previous issue, there would appear to be considerable information as to the working of filter beds to be derived from a study of the algae and other growths which occur upon them. Aside from the bacterial jelly which is found to cover the media to a greater or less depth there appeared at different times upon several of the beds several different kinds of growths. The most striking of these was a luxuriant growth of pink gelatinous material which followed the clogging and pooling of the filters. (Probably the same or a similar growth was that observed at Dorking, England, where it was described as a pinkish-yellow filamentous growth. In Kingston, England, a short, fibrous, gray growth appears annually on the surface of the filter between November and March, forming an almost impervious mat.) On outdoor filter No. 5 a layer of material resembling a mat of wool fibres

encased in bacterial jelly formed between the upper layer of stones and the ones immediately beneath, which seriously decreased the surface aeration of the bed and also its porosity.

The clogging of the filters seemed to be confined to the upper 6 inches of most of the beds, the exceptions being the slag bed, which sludged up to a depth of 16 inches, and the fine trap bed, where the worst clogging was confined to the upper 3 inches. In most of the beds large quantities of larvæ were found, probably those of the moth flies which are found in enormous quantities around most sprinkling filters. These larvæ were found adhering to the cleaner stones within the top foot. They were especially numerous in the lower indoor bed, which was provided with the special aerating pipes, large numbers of the stones below the depth of 3 inches being covered by very active white larvæ.

As was shown some time ago by the special experiments at Waterbury, Conn., an examination of these beds at the end of the test indicated that there had been no lateral sub-surface distribution, as all of the stones in the corners of the beds which were not reached by the spray were perfectly clean.

The ventilated indoor bed gave excellent results, better than any of the others, but in spite of this the experimenters believe "that there is not sufficient variation in the action of the filter under these two conditions (with and without the special ventilators acting) to show conclusively any distinct advantage due entirely to the use of ventilating appliances, although it is believed that ventilation will distinctly benefit and render uniform the action of the various parts of a percolating filter, and that its absence might tend to foster clogging or reduce the effectiveness of a filter in spots." We do not understand from this just what the conclusion on this subject was, unless that ventilation is very desirable, but that this particular method of securing it may have been unnecessarily elaborate.

One of the important features of the operation of a sprinkling filter is its automatic unloading, or voiding of digested suspended matter. Unless this takes place periodically the bed will clog and become more or less impervious. The methods employed at the testing station for securing this cleaning out of the beds were five: (1) Resting the beds, in order that the accumulated matter should dry sufficiently to desquamate and be washed out by the ordinary discharge from the nozzle; (2) washing the filter with water from a fire hose under pressure; (3) applying dry bleaching powder to the surface; (4) applying a strong solution of bleach through the filter nozzles; and (5) continuous disinfection of the influent.

The first method involves no expense, and with a well-constructed bed of uniform-sized large particles was successful in warm dry weather, but not in winter. The use of water jets under pressure removed large quantities of solids and left the bed in good condition, but it would require two or three men to manage the hose, would require probably a day for each acre, and the use of 100,000 to 150,000 gallons of water per acre. The use of dry bleaching powder, while successful, was not economical, but the application of a strong solution of bleach to the influent at the rate of two tons of powder per acre was found to be quite successful. The continuous disinfection of the influent maintained the filter in perfect condition, and supported the claims made for it by Dr. Rideal; it would require inexpensive apparatus and the same services for an attendant as is required for disinfecting water supplies. This bleach was found to destroy and eliminate in an hour or two the pink growth previously referred to. At one time when the lower indoor filter had been badly clogged it was entirely cleared in five hours by applying to the influent 850 pounds of bleach per acre. (This clogging followed about a week after the discontinuance of the ventilation system.)

When the beds unloaded after a rest it was found that the coarse trap bed unloaded the best, the process being a steady, even discharge of solids, which continued for quite a time. The coarse limestone, due to its large voids, easily yielded the stored solids, while the slag bed, probably due to the porous nature of the medium, which allowed the slimy deposit to take a firmer

hold upon it, discharged the solids only after several hours' service, and in less amount than the small-sized trap rock. The fine limestone, on account either of its depth or of the small size of the voids, or other unknown causes, discharged very little of the stored matters.

At once after the unloading in the spring the quality of the effluents all improved. This might not be entirely due to the rest and unloading, but partially to the increasing temperature stimulating biological activity. This unloading took place after the accumulation of solids during the winter, when the biological activity was at a minimum; and it was found that there was a slight continuation of the unloading for several weeks after the first maximum voiding of stored matter.

The upper indoor filter was operated to determine whether it is possible to operate a fine media bed, over which roughly screened sewage is well distributed, by properly arranged resting periods and raking. It was judged from this experiment "that it is not practicable to apply a poorly prepared influent to a sprinkling filter, expecting to maintain it by rest and rakings, on account of the low rate of operation and high cost of maintenance, together with the inequality of the effluent over extended periods."

Concerning the removal of bacteria, it was found that each of the beds removed on the average from 75 to 87 per cent., although during the period of unloading the numbers in the effluent were in excess of those in the influent. At times the percentage ran above the nineties for several weeks at a time.

It was believed that, although fats are very resistant substances, in the beds having the greatest bacterial action, at least, the fats were oxidized, as less of such matter was found in the effluent than in the influent, and none was found stored in the beds at the end of the experiments.

Concerning the stability of the effluents, the report contains the following:

The object of the sprinkling filter is to render stable the putrescent matters of sewage. Over long periods of time it ought not to remove solids, for in order that such a filter shall not become clogged it must unload the accumulated matter, and thus establish an equality between total suspended solids in the influent and effluent.

Also many substances nitrogenous or carbonaceous in their composition and therefore reported in the analyses under organic nitrogen or oxygen consumed, are stable, and not acted upon in transit through the filter; therefore, to preserve the permanence of the filter, they should be thrown off.

The measure of the putrescence of sewage is its avidity for oxygen. An effluent which requires but little oxygen from the stream into which it may be discharged will continue to improve as the stream flows on, regardless of the stable organic matter contained in said effluent.

For these reasons much weight should be given to the determination of relative stability of sprinkling filter effluents.

Comparing the general action of the fine limestone bed and the coarse trap bed, it was concluded that the oxidizing power of the seven-foot bed of coarse trap was equal to that of the eight-foot bed of fine limestone; and the almost perfect condition of the trap at the end of the test, as compared with the slightly clogged condition of the finer limestone, was much in favor of the shallower and coarser bed.

Apparently about the only conclusion of importance from the operation of the Hamburg filter was that it is impossible to maintain a sufficiently high rate with this method of distribution. After one week of service the upper or distributing layer of coke was so clogged with the suspended solids and colloidal matter that sewage stood continuously on the surface, and this layer did not seem to unload itself. It was found that the fine coke was embedded in a gelatinous mass, forming an almost impervious layer.

The suspended solids in sprinkling filter effluents are either granular or flakey. In August they averaged 29.5 per cent mineral matter from one bed and 35.5 from another. Settling for a nominal storage of two hours in a horizontal tank proved sufficient to remove a large part of the suspended solids and yield a uniform effluent.

NEWS OF THE MUNICIPALITIES

Current Subjects of General Interest, Under Consideration by City Councils and Department Heads—Streets, Water Works, Lighting and Sanitary Matters—Fire and Police Items—Government and Finance

ROADS AND PAVEMENTS

Movement for Good Roads to Be Made National.

Phoenix, Ariz.—Governor R. E. Sloan has been asked to issue a call for a good roads convention, which, it is hoped, will be the beginning of an attempt to institute a movement, national in scope, for the construction of a transcontinental highway. This highway, it is understood, is to secure the backing of the automobile manufacturers throughout the United States, and of this support the movement is already assured.

Oiling the Streets

Kingston, N. Y.—Street Superintendent Simpson has given Albany avenue a coating of oil to lay the dust. An experiment in the calcium chloride treatment for laying dust will be tried under the direction of the Street Superintendent on Railroad avenue in the near future. A representative of a Syracuse concern is anxious to make the test, and Railroad avenue was chosen as combining all kinds of traffic.

Old Bridge Caves In

Trenton, N. J.—A section of the South Warren street stone bridge about 8 by 50 feet in area caved in last week. All of the sidewalk and part of the roadway on one side fell in. The structure is 50 feet in length and 75 feet wide.



Courtesy Daily State Journal, Trenton, N. J.

LEAKAGE FROM SEWER BREAKS DOWN OLD BRIDGE

It is believed that the structure was made weak by leakage from a sewer. The main portion of the bridge was built in revolutionary days and the passageway was constructed in 1822.

Sidewalk Laying Will Be Pushed with Vigor

Altoona, Pa.—Mayor Hoyer has announced that the annual sidewalk crusade has been inaugurated and will be pushed vigorously throughout the summer. The daylight patrolmen were given a number of notices to be served during the present week, and next week a special officer will be delegated to give his entire time and attention to the sidewalk work. The work will be pushed vigorously in every ward of the city, wherever new walks are needed. The notices that are served by the officers give the property owners ten days in which to award contracts and get the work under way, and it was stated by the Mayor that where the property owners fail to comply with the notices the walks will be laid by the city and the property owner compelled to pay for it under the provisions of the city ordinances. There are already some on the list who failed to comply with the notices last summer, and their walks will be promptly laid by the city authorities.

Plan Boulevard System

South Bend, Ind.—An elaborate municipal boulevard system which may eventually extend north to St. Joseph, Mich., is now proposed by the South Bend Board of Park Commissioners. The improvement, which would mean the beginning of a boulevard park system for the city, is made possible in the new powers of park boards of second-class cities. The added power is the result of laws which were adopted during the last session of the State Legislature. The plan for a boulevard system in South Bend and its ultimate extension through Southern Michigan to Lake Michigan was launched at a recent meeting of the Park Board. The boulevard as discussed would have its inception on the north side of the river at the dividing lines of South Bend and Mishawaka, continuing west to the west bank of the St. Joseph River, and thence north along the river to the beginning of Riverside Drive. This pretty thoroughfare would form a portion of the boulevard, it is planned, continuing through Leeper Park and following the river bank to Mosquito Glen Bridge, four miles north of the city.

City Paving Work Completed

Puyallup, Wash.—The street paving contract has been completed and the Warren Construction Company is shipping the remnants of its plant as fast as possible to different parts of the country. The first paving was laid in Puyallup in November, 1909. In all, the company has spent 18 months in the city doing the work. It was impossible to work constantly, however, because of weather conditions. Puyallup now has about 75,000 square yards, or approximately 6½ miles, of paved streets. The work has been done at a cost to the city of about \$250,000.

Contractor Took Liberties

Altoona, Pa.—Mayor Hoyer caused his policemen to stop repairs to the paving destroyed several weeks ago by the breaks in water pipes, because the contractor was selling the old bricks and proposed to use new ones in the repairs. Hoyer maintains the old bricks belong to the city, unless the contractor is going to use them in the repairing. The City Solicitor has been asked for an opinion.

For Auto Road

Hamilton, Mont.—The Hamilton Chamber of Commerce has about completed arrangements for the launching of a campaign, which, if successful, will result in the establishment of a park to park highway under federal, state and county control, and connecting the Yellowstone National Park with the Glacier National Park. The road, if built, will be about 450 miles in length, and will cross six or seven counties. As planned it will traverse the entire length of the Bitter Root Valley, passing through Missoula, thence across the Flathead reservation along the east side of Flathead Lake, and then to Glacier National Park. The road will pass through approximately 40 towns, connect two military reservations and cross four great railroads. Passing as it would through much of Montana's scenic country, the road will furnish abundant opportunities for tourists. At the present time the road is well defined, and needs only to be united and some sections built.

Move for Good Roads

Bowling Green, Ky.—Good roads projectors of Tennessee and Kentucky met here last week to frame plans for the completion of the Lincoln-Jackson way. A large delegation of Tennesseans, headed by 500 citizens of Nashville, assured the Kentuckians they will be ready to go on with the highway as soon as the Kentucky section of the road reaches the State line. It is planned to extend the Lincoln-Jackson way from Mammoth Cave to Nashville via Bowling Green and Franklin, over the old Louisville and Nashville Pike.

SEWERAGE AND SANITATION

Important Contracts for Sewers Are Begun

Syracuse, N. Y.—Work is now in progress on three of the most important contracts of the general intercepting sewer improvement. Young & Dounce started driving piles in Hiawatha avenue for the foundation of the north section of the Harbor Brook intercepting sewer. The C. T. Hookway Construction Company is nearly ready to place concrete on a part of the southern section of the same improvement and concrete is being placed in Wallace street and North Franklin street on the Onondaga Creek intercepting sewer. The first work south of West Onondaga street on the Onondaga Creek sewer will be started in a few days. The tunnel under West Onondaga street has been finished and an open trench will be excavated through the property of the Delaware, Lackawanna & Western Company between West Adams and Onondaga streets as the first section.

Public Meeting to Talk Sewage

Hasbrouck Heights, N. J.—That the sewerage question is a live issue was made known at a recent Council meeting, when Mayor A. C. Austin was authorized to call, at his pleasure, a public meeting to discuss the matter. As a preliminary Mayor Austin will talk upon the sewerage question at the next meeting of the Borough League Forum.

State Board Orders Sanitary Measures

Oil City, Pa.—The citizens of Oil City have been instructed by Dr. Dowling, of the State Board of Health, to immediately clean up their town, provide better drinking water, improved street drainage and enforce sanitary and health rules in restaurants and other public service establishments. Olemargarine, Dr. Dowling states, has been served for butter, and canned milk mixed with water for dairy milk has been popularly served.

Important Additions to Sewer System Necessary

Buffalo, N. Y.—A system of sewers that will cost the city several millions of dollars is now claiming the attention of the Board of Councilmen. The tough question is: How are they to be paid for? Commissioner Ward, who proposes the building of this system, recommends that it be made a general fund charge, and the Board of Aldermen has approved his recommendation. A majority of the Board of Councilmen voted in committee to approve it, but at least two members believe they should be paid for by local assessment levied in the sewer districts benefited. As recommended by the Commissioner, an enabling act will be necessary to issue bonds to pay for the sewers in the first instance. He favors spreading the payment over a long period of years and creating a sinking fund for that purpose. If the Mayor signs the majority report that probably will be adopted the bill will be sent on to Albany as soon as it can be prepared. "The bill should be broad enough," says the Commissioner in his communication, "to cover the necessary general improvements, but guarded against the inclusion of local sewers."

Pure, Clean Food in Seattle

Seattle, Wash.—Seattle now has an ordinance making the strictest kind of regulations concerning clean food. The whole matter has been put under the control of the Health and Sanitation Department. The "bakery ordinance" requires a bakery, candy kitchen, restaurant or confectionery shall apply to the Commissioner of Health for a permit, which is to be issued only after the Commissioner of Health has caused to be inspected all the fixtures and appliances to be used. The requirements for light, ventilation, cleanliness and the attire of workers where food products are prepared are very strict. The workmen are required to file certificates to be approved by the Commissioner of Health. The use of tobacco in the workrooms is forbidden. An ordinance requires screening of all prepared foods—that is, foods which are not necessarily to be cooked before eating. The Health Department makes a bacteriological examination of milk of all the more important dairies every month, and a chemical examination every few days. This method, the Health Commissioners report, has almost entirely changed the character of the city's milk supply.

Property Holders Refuse to Use New Sewers

Millville, N. J.—Complaint has been made to the State Board of Health that, although Millville has erected a sewage disposal plant at the cost of about \$25,000, a number of property holders refuse to connect with the city system, but are still using a private sewer which dumps into Maurice River.

Sewage Disposal Plant of New Britain

New Britain, Conn.—The expenditure on the sewage disposal plant to date is approximately \$100,000, and probably before the city will fully accomplish its purpose another sum nearly equal will have to be paid out. The filtration plant is troubled considerably on account of iron in the sewage and the beds filter 6,000,000 gallons of sewage, when they were primarily designed to filter 3,000,000 gallons. The trouble caused by the presence of iron in the sewage will probably be the reason for early action on the subject.

Will Investigate Cost of Sewers in Other Cities

Macon, Ga.—The Mayor has appointed a special committee that will make an investigation into the cost of sewers in other cities as compared with the expenses here. The committee will visit Atlanta, Memphis, Birmingham and other cities so as to obtain the facts and figures first hand. The investigation will be made at once, as Council has suspended the sewer work for only thirty days.

City Gets a Premium on Sewer Bond Issue

Syracuse, N. Y.—City Comptroller M. E. Monahan has received payment for the \$100,000 intercepting sewer bonds which were sold to Curtis & Sanger, of Boston, April 13. The money was deposited and will be at the disposal of the Intercepting Board. The bid on which the bonds were sold was \$103,301.11 and accumulated interest. The interest for twenty-three days from the date of the issue of the bonds is \$287.50, which, with the premium of \$3,301.11, amounts to \$3,588.61. The bonds bear 4.5 per cent interest, but the premium reduces the interest to a basis of 4.09 per cent, and if the use of the premium by the city is considered the interest charge is reduced to 4.01 per cent. The same price was paid for the \$100,000 of park improvement bonds, which, according to the bond agents, is the highest given for municipal bonds in the last eighteen months. This fact, Comptroller Monahan pointed out, speaks well for the credit of the city. In all, twenty-six firms bid, four offering over \$3,300 premium, six of the others offering over \$2,800 and only two offering less than \$2,000.

Plans for Milk Exhibit

Philadelphia, Pa.—Upward of 300 persons, many of whom represented civic societies, attended a conference at the Mayor's office recently in the interests of a milk exhibit soon to be held in this city. Dr. Joseph S. Neff, Director of the Department of Public Health and Charities, presided at the conference. Much enthusiasm was manifested by those present, who assured Dr. Neff the heartiest co-operation in promoting the forthcoming exhibition. The milk exhibition, which will be one of the most unique affairs of its kind ever held in this country, will begin May 20 and will continue the entire week. The exhibit follows naturally upon the work of the Milk Commission, which lately made an exhaustive report on pure milk to the city authorities, the American Association of Medical Milk Commissions and Certified Milk Producers' Association of America, organizations whose work is confined to the problem of improving the milk supply of the country, meet in this city while the exhibition is in progress. Director Neff, in a brief address, reviewed the history of the handling of milk in this city, taking the opportunity of commending the newspapers for the part they have had in the crusade. Dr. Samuel Hamill explained the purpose of the milk show and announced that at conferences of two organizations to be held in connection with the exhibit 61 cities would be represented. He said that the aim of the exhibition was not to alarm consumers, but to point out the mistakes that are being made. He said that health officers and physicians would deliver lectures, and moving pictures would be used to show the danger of carelessness in the various processes between production and consumption. In conclusion he declared that much of the criticism leveled against the producers of milk should be leveled against the consumer.

WATER SUPPLY

Columbus Water Supply Polluted by Sewage

Columbus, O.—The State Board of Health will be requested to investigate the conditions relative to the alleged pollution of the Scioto River at Marion, Kenton, Magnetic Springs, Prospect and Marysville. This decision was reached at a meeting of the Board of Health after Dr. Clemmer read a communication from W. R. Copeland, chemist of the municipal filtration plant, in which he recommended that the above cities be compelled to erect sewage disposal plants. It is claimed that in these cities the Health Board is not following out the rules of the State Board, and that the source of the Columbus water supply is being polluted. The recommendations of Mr. Copeland were made after a personal visit to the towns.

Court Sustains Right to Cross Property with Water Conduit

Ogden, Utah.—A decision has been handed down in the District Court authorizing Ogden City to enter upon certain property in Ogden Canyon owned by W. G. Wilson and proceed to construct thereon that portion of the city's Cold Water Canyon conduit specified in the plans adopted by the Engineering Department. Mr. Wilson objected to the conduit being installed across his property without being remunerated for the privilege, and obtained a restraining order from the court. He placed his damages at \$1,000, which the city considered exorbitant, and condemnation proceedings were instituted, as in the cases of the owners of the Badger-Farr property and the Ogden Medicinal Springs Company. The work will not be delayed.

City Takes Steps Toward Purchase of Water Plant

Racine, Wis.—At the first meeting of the new Common Council a resolution was adopted empowering the Mayor, City Engineer and City Attorney to confer with the water works company as to the possibility of an amicable transfer of the plant to the city and to secure if possible the company's estimate of the value of the plant. An official notice and copy of the resolution was served on the water company for the purpose of opening the negotiations.

Special Court Appraises Water Plant

Council Bluffs, Ia.—A special court appointed to appraise the Council Bluffs water plant in the decision fixed the value of the plant at \$510,500. The result of the condemnation proceedings is a disappointment to both sides. The city expected a valuation of \$450,000 and the company wanted \$700,000. The company's offer to sell to the city for \$500,000 made during the appraisal hearing was refused.

Town Affected by the New Water Works Statute

Kearney, Neb.—The last Legislature passed a law requiring customers of water works municipally owned to pay for the extension of pipes, and this law comes as a check on an extensive improvement campaign planned by the City Council of Kearney, although improvements and extensions of the city water property this year will be made regardless of the law. It is believed that the number of improvements will be lessened by this law, but that there will still be extensions sufficient to keep a force of men busy putting them in. The demand for extensions has been unusually great since the city assumed ownership of the plant. Many of these demands come from new sources and will mean new customers, while others are for improvements to the system as it now exists.

Filtration Plant Employees to Be Under Civil Service

Cohoes, N. Y.—As the filtration plant has practically been completed and will soon be placed in operation, there arises much conjecture as to whether or not the men who are to be employed at the plant will be under the jurisdiction of the Civil Service Commission. Men who are more or less skilled in the work will have to be employed at the plant, and for this reason, and because of the fact that there is much valuable city property to be taken care of at the new city institution, it will be necessary, so it is understood, to have the men who are to work at the plant pass an examination as to their fitness, and this examination will be conducted by the Civil Service Commission.

Waterloo Water Works Improvements

Waterloo, Ia.—Improvements in the water works have been going on for a year and are not yet completed. The illustration shows the new water works office just occupied. It is built over one-half of a reservoir which holds 2,000,000 gallons. At some later period a four-story municipal building may be built over the other half of the reservoir, founda-



WATER WORKS OFFICE OVER RESERVOIR

tions having been put in with this in view. The office measures 40 by 120 feet. The facing is of pressed brick and the trimmings Bedford stone. The cost of the building was \$10,000. The water in the reservoir comes from two artesian wells. A third is being drilled and has been sunk to a depth of 940 feet. For the first 150 feet it is 20 inches in diameter and from that point 12 inches.

Official Test of Standpipe

Montgomery, Ala.—An official testing of the standpipe at the river pumping station has been made. This plant is to furnish river water for boiler purposes for railroads and manufacturing establishments. It has a capacity of from one-half to a million gallons of water. No flaws have been found.

City Collecting Old Water Bills

Spokane, Wash.—Bills for tapping city water mains amounting to \$8,000, some of them outstanding for years with no effort made to collect them, are now being collected by the legal department and suit instituted where debtors do not pay up at once. Warning that suit would be instituted unless payments were made, given by Assistant Corporation Counsel H. M. Dumphy, resulted in the last 15 days in the collection of \$3,794.80 of the \$8,000.

Raw Water in New City Basins

Niagara Falls, N. Y.—Raw water has been let into the big basins at the new pumping station. Engineer W. D. Robbins superintended the work, and as soon as the scaffolding was taken out of the basins the valve in the intake pipe was opened and the almost pure water from near the middle of the river rushed into the basin at high pressure. The water will be allowed to settle in the basin until the electric pumps are connected, when tests will be made for several days. The pumps are not expected to be connected for another week yet.

Court Decides City May Own Water Plant

Bethlehem, Pa.—Bethlehem won an important victory when the State Supreme Court here reversed the Northampton County Court and held that the borough has the right to construct a municipal water plant. The court, however, holds in an opinion in another case effecting Bethlehem's water question that the municipal election to determine whether the indebtedness of the borough should be increased for the purpose of constructing the water works was invalid. It is held that the ballots did not comply with the requirements of the law of April 29, 1903, because the words "yes" and "no" were not printed upon them. This, the court holds, vitiates the election. The election case suit was brought by four taxpayers, while the suit involving the right of the borough to build its own water plant was brought by the Bethlehem City Water Company.

STREET LIGHTING AND POWER

Experimenting with New Lamps

Schenectady, N. Y.—As an experiment in street lighting the Schenectady Illuminating Company has recently installed 18 of the new flaming arcs on Dock street. Although this type of lamp has been used on lower State street by the business men, this is the first time they have been used for street lighting purposes in this city and they have been found very satisfactory during the two weeks they have been in operation. The lamps were installed at the expense of the Illuminating Company and the city has agreed to pay half the expense for the current in addition to the \$60 per year rental for each lamp, in accordance with the standing contract.

Rapid Progress of Municipal Plant in Lighting Streets

Richmond, Va.—Engineer E. W. Trafford, in charge of construction work for the municipal electric plant, has reported to the Council Committee on Electricity that within the next 30 days he would be ready to cut out all rented lamps save about 50 in outlying districts, the lines of the city plant not having yet reached out to embrace them. He said that he was pressing the work forward as rapidly as possible to save the double cost of renting lights and at the same time operating the power house, and for that reason had not as yet taken up the question of extending the ornamental lights westward on Broad street to Pine street, for which funds have been provided.

Favorable Monthly Report of Municipal Light Plant

Pasadena, Cal.—The February report of the general manager of the municipal electric light plant shows that the city made a net profit of \$6,225.40. Allowing for the payment of bonds, during the month of February the city cleared over \$4,500, which can be applied to the depreciation fund or to new construction.

Plan Conduits for All Wires

Pasadena, Cal.—The special committee appointed by the Mayor for the purpose of making recommendations in regard to the disposition of overhead wires made its report to the Council and recommended a municipally owned conduit system for all wires for the use of which corporations should pay in rent the equivalent of the interest and principal on a bond issue plus the cost of maintenance. The report further recommended that a commission be appointed to present in concrete form a plan to put wires underground in the business and congested districts and to establish one municipal pole line where conduits are impractical. The plan would be to have this pole line replace the half dozen present pole lines which duplicate in all parts of the city, making the streets hideous with their landscape-blocking obstruction.

FIRE AND POLICE

Fire Traps Must Be Razed

Spokane, Wash.—A score or more alleged unsanitary, unsafe and fire-trap buildings in the business district, the owners of which were successful in dodging condemnation orders of the former city administration, must be razed within 30 days, according to orders of Building Inspector John M. Goodwin. That he will attempt to enforce the penalty of \$100 a day fine and jail sentence against every owner who attempts to dodge the issue is the statement of the inspector. The buildings were condemned and ordered torn down by the former administration, but nothing was ever done when the owners refused to act.

New Hydrants Help Fight Fire

Jersey City, N. J.—Street and Water Commissioner Finke and Engineer J. W. Griffin, of the Water Department, have tested the water pressure at the new hydrants recently installed in connection with new water pipes. The test was very satisfactory. It showed that Jersey City's fire fighting ability has been greatly increased by the installation of new hydrants and water pipes. Commissioner Finke insists that the test ought to result in a further reduction of the fire insurance rates.

Fire Alarm System Installed

Placerville, Cal.—The new fire alarm system for this city is now installed. The fire bell has been moved from the Plaza to the top of Canon Hill and electrically connected with the central exchange office of the telephone company. The city has been divided into eight fire wards, and every telephone is a fire alarm box. Cards have been placed on every telephone in town, giving number of ward and directions how to sound an alarm.

Automobile Police Patrol for Emergency Use

Charleston, S. C.—The big automobile wagon of the Police Department has arrived, and is being given its final try-out. The introduction of the automobile patrol does not mean the exit of the "Black Maria." The new patrol will be used only for emergency cases, during fires or for duty in outlying districts.

City Acquires Automobile Apparatus

Bay City, Mich.—A new automobile patrol for the police has been received and will be put into commission at once. The horse patrol will not be used again.

Street Department Automobile Becomes Hose Wagon

Haverhill, Mass.—The latest acquisition to the city's fire equipment is an automobile combination chemical and hose wagon. The car is a beauty. It is the old Knox automobile purchased for the Street Department, and which was smashed up in a collision with a trolley car. It went into storage for several months at the Ward 6 engine house, but was turned over to the Fire Department a few weeks ago and by them entirely rebuilt. It now has a body which carries about 600 feet of hose with the necessary pipes and appliances, a couple of chemical tanks and has a rail and running-board. There are two seats forward, and while the new machine is small, it is, nevertheless, efficient along all lines of practical fire fighting. It will do fine service in responding to long run calls, there being plenty of power and endurance, and the apparatus is one of the city's most valuable acquisitions.

Suburbs Supplied with Fire Alarm Boxes

Oakland, Cal.—The city electric department is busily engaged in installing fire alarm boxes in the annexed district. The first lot of eight boxes are already in operation and the balance of about 25 boxes will be installed as rapidly as the shop can turn them out. An unavoidable delay in this work was caused on account of moving, as everything had to give way to that for about two weeks. The new machinery for the fire alarm shop has been received and is installed. With this machinery it will be possible to turn out a better grade of work and more per hour, thereby cheapening the product. The last shipment of electrical equipment for the fire alarm installation in the new building is received, and will be installed in the next few days. When this work is completed Oakland will have as an efficient an installation as can be found, and is far better housed and protected than any other fire alarm installation in the country, according to George Babcock, head of the electrical department.

Made-Over Chemical Apparatus Stands Tests

Bridgeport, Conn.—Thorough and successful tests of the new auto-chemical which is to be stationed at the Maplewood fire house have been made. This piece of apparatus is largely of the made-over type of which Superintendent of Machinery Tracy has done much of the work. The chemical, which formerly was horse-drawn, has been taken apart and is now mounted on a large type chassis from the Locomobile factory.

Ardmore Adds to Fire Equipment

Ardmore, Okla.—Ardmore has added to its fire fighting equipment an apparatus that would do credit to any city—a 55-horsepower auto truck and chemical engine combined. The machine has been set up, but before it is given a test the factory will send a man to demonstrate it. The truck carries six men besides the driver, and will carry 1,000 feet of hose and two ladders; the chemical tank having a capacity of 50 gallons. The machine was built by the Seagrave Company, of Columbus, O., and cost, delivered in Ardmore, \$4,600.

GOVERNMENT AND FINANCE

Mayors of All Cities to Serve Four-Year Terms

Harrisburg, Pa.—The bill fixing terms of Mayors and Select Councilmen of all cities of the commonwealth at four years and of all Common Councilmen at two, has been signed by Governor Tener. The bill was presented by Mr. Hess, Lancaster, and applies to all officials of the classes mentioned to be "hereafter elected." The repealing clause repeals all general, special or local laws inconsistent with the act.

Organization of Commission Government

Birmingham, Ala.—At the first meeting of the Commissioners under the new form of government the Commissioners agreed among themselves upon what department should be handled in detail by each of the members. The belief is official, however, that all questions such as public policy and generalities will be handled by the Commission as a whole. President Culpepper Exum will have the following departments: Accounts, finances (including public assessments for improvements), public affairs, Fire Department and the Building Inspector's department. Commissioner Lane will have charge of the following: Public Justice, Recorder's Court, City Attorney, Police Department, Health Department and the plumbing department. Commissioner Weatherly will have charge of the following: Department of streets, parks, city and public property, city and public improvements, electric department, engineering department. Twenty-nine city employees were dispensed with and a saving to the city effected of \$31,460 for the year.

Bond Issue Is Sold Locally

Houston, Tex.—The South Texas National Bank has purchased the entire issue of \$500,000 in bonds floated by the city of Houston for the purpose of constructing a steel and concrete viaduct over Buffalo Bayou at Main street. By the terms of agreement the South Texas National Bank will pay a premium of \$1,000 for the bonds. They are 4½ per cent securities, maturing at the expiration of 30 years, with a reservation by the city to call them in 10 years before expiration.

Will Ask for Bids on City Deposits

Woonsocket, R. I.—The perseverance of Mayor James Mullen in pushing the matter of getting more interest on the city's deposits has resulted in both branches of the City Council unanimously passing a resolution directing the City Treasurer to advertise for bids from local banks and trust companies for the city's deposits. The city now receives 2 per cent, the same as all other depositors on checking accounts, and Mayor Mullen pointed out that the city of Providence receives 3 per cent on its daily balances, while the city of Pawtucket receives more than 3 per cent.

Retiring Administration Leaves Envious Record

Freeport, Ill.—At the last Council meeting of the retiring administration City Treasurer Wagner made reports for the fiscal year. His reports show that the balance of the corporate fund now in custody is \$22,029.15, not including delinquent taxes, which will bring the amount up to \$35,252.55. The amount of the fund is large for Freeport and the city's finances are in excellent shape, about \$47,000 better than at the beginning of the administration that has just closed. Starting with a deficit of over \$12,000, the administration just past has wiped out the deficit and left the treasury comfortably full. Although the administration has been economical and has left a large sum in the corporate fund, it has spent much for improvement and new equipment. The Street Department is well supplied with new wagons, etc.; the Fire Department has its new hose house in West Freeport, new wagon and equipment; the several city departments have been thoroughly reorganized on a business basis and a new accounting system has been installed. New office equipment for the City Hall has been purchased, too, and there have been various expenditures for other improvements. The city's affairs are clean and sound and the new administration is starting in with every possible advantage.

STREET CLEANING AND REFUSE DISPOSAL

City Intends to Keep Streets Clean This Summer

Wilmington, Del.—The Street and Sewer Commissioners have started an investigation with a view to improving the street cleaning. The immediate cause was complaints from the Delaware Mills that loads of debris were being dumped on the Morris Road. The directors said there were constant complaints of this sort from all over the city. Street Commissioner Pierson said city contractors had claimed it was done against their orders by irresponsible carters. It was difficult to catch any one because the carters did not do it if a policeman was around. It was obviously impossible, the directors thought, to keep a policeman on every vacant lot in Wilmington. The directors also complained that too large loads were carried, so that dirt fell off and was tracked along the streets. It was thought that might be one way to trace those who dumped loads in unlawful places. The department will take steps to make examples of some of the offenders.

Clean-Up Weeks Are Popular

Harrisburg, Pa.—Mayor Meals issued a proclamation naming the first week in May as clean-up week, and has assurances of co-operation from the Civic Club and other sources for giving Harrisburg a thorough house cleaning.

Knoxville, Tenn.—The week beginning Monday, May 15, has been designated by the Board of Public Works as "clean-up week" in Knoxville. The Police Department was instructed to notify the occupants of each house to begin "cleaning up" that day. All the city carts and wagons will be used that week to haul away the garbage. The Board also instructed the police to serve notice of the law on home owners, where there are no numbers on the houses.

City Officials Pleased with Street Flusher

Bridgeport, Conn.—Mayor Buckingham and other city officials express much satisfaction with the demonstrations of the Studebaker street flusher. It was tried on the brick pavement on Broad street, south of State street, the wood block pavement on Main street and the Belgian block pavement on Water street. The Board of Apportionment has made the appropriation for the purchase of a flusher and the various types are being demonstrated by the builders before Superintendent of Street Cleaning Schreiber decides which kind to purchase.

Board of Public Works to Put Auto Garbage Truck on Street

Manchester, N. H.—The practicability of the auto-chemical has been so clearly proved that the new Board of Public Works has decided to install a large garbage automobile truck. The new wagon will weigh upward of three tons and will have a capacity of six cubic yards at a load. This large amount with the quickness with which the auto can get about the city will allow the auto to take the place of three ordinary horse-drawn wagons, which would indicate that by its installation the city will be able in the course of the year to save a considerable sum of money. The saving is estimated to be such that the truck will pay for itself in the course of its life and in that time the scavenger service will be by its use greatly improved. It is the intention of the Board to use the new machine in the congested parts of the city. The probable cost of the truck will be in the neighborhood of \$3,400. Several representatives of the different automobile firms have been either in communication with the Board or appeared in person with illustrations of the trucks, and while it is an assured fact that the Board is to purchase one, the exact model has not yet been decided upon. It is understood, however, that the machine will be similar to that adopted in many of the large cities throughout New England, and will be in operation by the last of the month. It is anticipated that before the spring "housecleaning" has been completed the machine will have done its part in the important work. In an interview with Chief Engineer Samuel Lord it was learned that the residents of the city are responding most gratifyingly to the call of the department for cleaning up of the winter refuse, but there are still a great many who have not as yet done so. All the garbage teams are patrolling the city for this purpose, and will be kept at the work until every nook and corner has been taken care of.

RAPID TRANSIT

Franchise Is Refused

Brownsville, Tex.—The application of the Brownsville & Gulf Railway for a franchise to broaden the gauge of its tracks on Twelfth street and to operate a motor car line between Brownsville and Matamoros has been denied by the City Council. The company's tracks run through the heart of the city and have not been used for years. The City Council recently declared the tracks to be a public nuisance and instructed the City Marshal to abate the same. A majority of the Councilmen held that to grant the Brownsville & Gulf a franchise on Twelfth street would preclude the securing of a street railway system throughout the city later. However, a resolution was introduced offering the company a franchise to operate a motor car system over the whole of the city.

Plans of San Francisco's Municipal Street Railroad

San Francisco, Cal.—Commissioner Charles S. Laumeister of the Board of Public Works, who has charge of the details of the construction of the city's Geary street railroad, intends having ornamental trolley and lighting



Courtesy San Francisco Chronicle.

PLAN OF ORNAMENTATION FOR SAN FRANCISCO'S MUNICIPAL RAILROAD

poles and grass plots, as shown in the illustration, on that portion of the road from Point Lobos avenue to the beach. Geary street is too narrow to admit of such ornamentation. The contracts for constructing the road and building the cars will be let in about a month.

Council Renews Franchise

Quincy, Ill.—The City Council has renewed the franchise of the St. Louis, Terre Haute & Quincy Traction Company. The new features incorporated in the ordinance are as follows: No franchise license shall be exacted for the first 10 years of the 50-year franchise; on the following five years \$10 a year per car shall be required; five years still later a flat cash license of \$500 shall be required, and at the expiration of the last five years a flat license of \$1,000 a year shall be required for each year during the remainder of the life of the franchise. Some concessions are also made in the payment of street pavement. A former ordinance required a cash license of \$20 per car for each year of the franchise operated within 100 miles of Quincy. It is generally known what the route of the proposed line is in the city limits: It starts at Twenty-fourth and Spring; runs west to Eleventh street; south to York; west to Sixth; north to Vermont; east on Vermont to Eleventh, completing the city loop.

MISCELLANEOUS

City to Insure Boilers

Providence, R. I.—The city will insure 18 of its high-pressure boilers against explosion and accident. This action, which is a radical departure from the custom of the past, was decided upon by the committee on city property as a measure which would prevent the city from becoming liable in case of any accident due to a boiler defect.

New Method of Street Marking Adopted

Walla Walla, Wash.—With the building of new walks throughout the city, all of which are to be concrete, a plan of marking the streets has been adopted that will prove useful to Walla Wallans, as well as strangers, in finding their way about the city. The names of the streets are being marked in the walks at the corners before the concrete hardens, and when the walk is completed the name of the street is written so that it may be easily read. Those who know Walla Walla best are oftentimes at loss for their bearings, so crooked are the streets, and so various the angles and directions. So the new move for marking them is being met with approbation everywhere.

Richmond Adopts Segregation Ordinance

Richmond, Va.—Mayor Richardson has approved the Von de Lehr ordinance providing for the domiciliary segregation of the negroes of the city, thus making it a law. Along with it goes an ordinance, as yet incomplete, providing for the annexation of territory to the negro quarter and the furnishing of sewerage, lights and other improvements necessary to health and comfort so that there need be no undue crowding of the negro population.

Ask State Aid in Protecting Harbor

Natchez, Miss.—Congressman William A. Dickson, attended by a delegation of 60 business men and bankers, appeared before the Mississippi River Commission here last week in behalf of the claim for protection for the local water front. City Solicitor Martin presented the memorial from the Board of Mayor and Aldermen. The Board of Mayor and Aldermen submitted resolutions to the Commission, and the petition from the Chamber of Commerce, Retail Merchants' Association and Board of Supervisors was read by Congressman Dickson. The petition asks the Commission to make such allotment out of the funds at its disposal as to provide for the immediate and adequate protection of the Natchez front, or harbor, from further encroachment by the Mississippi River.

New Law to Protect Trees

Wilmington, Del.—The Board of Directors of the Street and Sewer Department wish particularly to call the attention of the public to the fact that nobody in the city has the right to remove, plant or trim trees in the city streets without permission from the department, according to the new law passed by the Legislature giving absolute control over trees in the city streets to the Street and Sewer Department.

Citizen Donates Land for Park

Morristown, N. J.—Thirty acres of land to be used for park purposes have been presented to the city by Frederick G. Burnham. The tract is particularly suitable for park purposes, containing the three well-known Mills ponds and the fine woods surrounding them.

Town to Have New Park

Muncie, Ind.—Muncie is to have another new park and rest ground. Under the supervision of the Board of Park Trustees work was begun to make a park out of the tract of ground lying along the Fort Wayne, Cincinnati & Louisville Railroad, east of Madison street, from Gilbert to Wisor street.

Will Enforce Ordinance Regulating Height of Awnings

Haverhill, Mass.—City Marshal Mack has ordered an inspection of awnings, and in sending it out he directed that the owners of awnings be notified of violations of the ordinances, and in the event of failures to remedy conditions, that complaints be made in court.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Reasonable Use of Street—Moving Building

Western New York & Pennsylvania Traction Company vs. Stillman.—Vested rights of a street railroad company to the use of a city street are subject to the reasonable use of the street for travel and other purposes. Whether the moving of a private building through a city street under permit from the city is a reasonable use of the street is a question of fact and usage in each particular case. Where a street railroad company sues to enjoin interference with its wires and overhead construction by a person moving a building through a city street, and alleges irreparable injury, it has no ground for complaint when the order vacating the temporary injunction provides that the work of taking down and replacing its wires shall be done by its own employees, and that defendant shall pay the expenses. —Supreme Court of New York, 128 N. Y. S., 363.

Streets—Injuries—Negligence

O'Connor vs. City of Dunkirk.—A gutter ran down the side of a street, and the crosswalk was elevated above the bottom of the gutter from $2\frac{7}{8}$ to $5\frac{1}{2}$ inches, and there was a break between the end of the crosswalk and the sidewalk, leaving a space of $10\frac{1}{2}$ inches over the gutter, over which space pedestrians were required to step in reaching the sidewalk. Plaintiff in the daytime, instead of stepping over such space, stepped into the gutter, which was filled with snow, ice, water and dirt, but was not sufficiently frozen to hold her weight, though it appeared to be so, and was injured. Held, that the city was not negligent for allowing the gutter to fill up with material not sufficiently solid to bear a pedestrian who stepped into, rather than across, the gutter. Where, in an action against a city for injuries by stepping into the gutter, the court ruled that it was not negligence for the city to so construct the crosswalk as to leave a $10\frac{1}{2}$ -inch space between it and the sidewalk over the gutter, and that the only basis of recovery was permitting the gutter to fill up with semi-solid matter, evidence of a resolution passed by Council some days before the accident to the effect that the Council regarded the gutterway as dangerous on account of the openings left between the sidewalk and the crosswalk was not admissible. —Supreme Court of New York, 128 N. Y. S., 398.

Contracts for Public Work—Quantum Meruit

F. V. Smith Contracting Company vs. City of New York.—Greater New York Charter provides that contracts for work for the city shall be made by the appropriate borough president or heads of departments under regulations established by the Board of Aldermen, and that work necessary to complete a particular job or supplies needful, which shall involve expenditure of over \$1,000, shall be furnished by contract with the appropriate borough president and heads of departments. Section 149, as amended in 1901, provides that no claim against the city for work done or material furnished with immaterial exceptions shall be paid unless an auditor of account shall certify that the charges are just and reasonable, and if, in an action against the city on a claim, not embraced in the exceptions, the amount claimed by plaintiff is in excess of the amount so audited, it must be established by competent evidence. Held, that a contract by a department without public letting is equivalent to an agreement to pay quantum meruit, and the specification of a price can be deemed only a maximum limitation raising no presumption in favor of the contractor as to the value of his services. Such a contractor need not postpone action upon his claim until it shall have been audited; but, when 30 days have elapsed since filing of his claim with the Comptroller, if it has not been acted upon, he may sue, alleging the contract price and assuming that it would be found moderate by the auditor, and in such an action the city need not affirmatively plead that the auditor has audited adversely to the claim, but may plead a general denial, and at the trial object to plaintiff's proof of the claim. —Supreme Court of New York, 128 N. Y. S., 351.

Annexation—Propriety

State ex rel. Simpson, Atty. Gen., vs. Village of Dover et al.—Whether unplatted territory, included within the limits of a village corporation, is so conditioned as properly to be subject to village government is a question of fact to be determined by the voters entitled to vote upon the question, and their decision cannot be disregarded unless it clearly appears to have been the result of arbitrary action. It does not conclusively appear from the evidence that the unplatted territory of the objectors, incorporated in the village of Dover, was included for the purpose of exacting revenue for village purposes and without regard to its adaptability to village government. —Supreme Court of Minnesota, 130 N. W. R., 75.

Assessments—Manner of Review

Durst vs. City of Des Moines et al.—Code provides that all objections to assessments for street improvements not made before the council shall be deemed waived, and Section 839 permits one affected by the levy of a special assessment to appeal to the district court and provides that upon such appeal all questions touching the validity of the assessment shall be determined. Held, that the objection that an assessment exceeded the amount prescribed by Code Supp. 1907, providing that an assessment shall not exceed 25 per cent of the actual value of the tract, the last preceding assessment to be prima facie evidence of such value, must be made before the City Council and an appeal taken to the district court from an adverse determination, and hence an owner may not ignore such remedy and bring an independent suit in equity to obtain relief from the assessment. —Supreme Court of Iowa, 130 N. W. R., 168.

Sewers—Assessments—Abatement

Granite State Land Company vs. Town of Hampton.—Under Public Statutes, 1901, authorizing towns and village districts to adopt the chapter authorizing the Mayor and Aldermen of any city to construct sewers they adjudge necessary for the public convenience and health, and Laws 1883, providing that, where the chapter is adopted by a village precinct, the Selectmen of the town in which the village precinct is situated shall perform all the duties conferred on the Mayor and Aldermen in case of cities, the Selectmen of a town which has adopted the chapter may exercise the powers conferred within the territorial limits of a village district organized under chapter 53, providing for the organization of village districts, with power to construct and maintain sewers, where the district has not voted to adopt the chapter, and has not taken any action as to the construction of sewers; the powers conferred by chapter 79 and by chapter 53 not being conflicting. Assessments for the construction of sewers levied on the lands benefited thereby are a legal exercise of the taxing power, and must be justified on that ground alone, though such an assessment is not a tax imposed for the expenses for public purposes in which all are interested, and though it is merely the division of the expenses of an improvement which renders property more valuable in the ratio of the increase of such value. An assessment under Public Statutes, 1901, authorizing an assessment on lands receiving special benefits from the construction of a sewer, for their just share for the cost of construction and maintenance, etc., recognizes the ownership of buildings on lands of another, and buildings so situate are real estate for the purposes of assessment, and are properly assessed to the owner thereof, such buildings being "lands." Under Public Statutes, 1901, authorizing one aggrieved by the refusal to abate a tax to petition the Supreme Court for an abatement, a tax invalid because assessed against a person not the owner is not abated on the petition of the owner, because justice requires that he shall be taxed for the value of his land, and the relief to which he is entitled is such as is equitable. A town leased its land for an annual rent for a long term of years. The lessee sublet to a third person on a like rent under a lease which had 17 years to run. The Selectmen of the town constructed sewers benefiting the land. Held, that the third person was properly assessed for his benefits resulting from the construction of the sewer, and, where he was assessed for the whole title, he was entitled to an abatement, so that the fair share of his interest would only be assessed against him. —Supreme Court of New Hampshire, 79 A. R., 25.

As The Engineer Sees It

TIME was, years ago, they say, when an engineer could build up a reputation merely by cutting down first cost of the materials he specified. But not *these* days, as we all know, for a significant change marks the present trend of professional practice and more than ever before "the engineer is known by his specifications."

Substitute materials must yield and are yielding to the inevitable—the doctrine of the survival of the fittest still governs—and where once it didn't make much more difference to the Engineer what went into sewer construction than what went into the sewer itself, he is today keenly sensible of the absolute importance to him of *sanitation* and *permanence both*, and *that* means

Vitrified, Salt-Glazed Sanitary Sewer Pipe

the only material that is acid-proof, gas-proof, erosion-proof pollution-proof and time-proof.

Western Clay Products Publicity Bureau

818 Delaware Street

Kansas City, Mo.

The Pipe Th

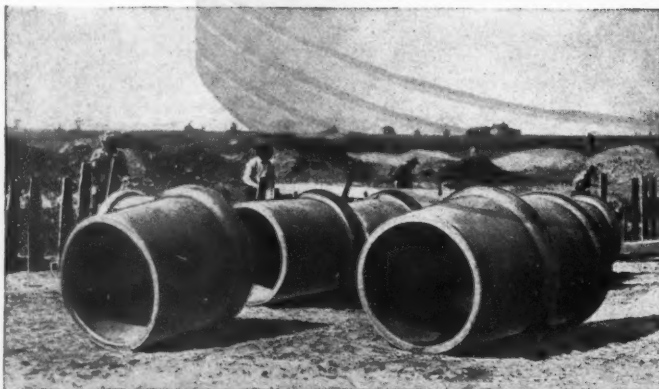
A Consensus

All Engineers are agreed upon one great fact, that Vitrified, so absolutely and wholly satisfactory in every respect that there

Vitrified, Salt-Glazed



Vitrified Sanitary Sewers, Kansas City, Mo.



Vitrified Sanitary Sewers, Denver, Colo.

It is the only sewer pipe that is sanitary—built of sanitary material—vitrified and salt-glazed.

It is the only material that does not and cannot absorb sewage and become foul.

It is the only material that is proof against erosion and corrosion.

It is the only material unaffected and undamaged by the strongest acids.

It is the only material simple and easy of construction.

It is the only material whose glazed, smooth surface gives the greatest carrying capacity possible by reducing friction, as there are no obstructions on the surface-faces to catch the solid matter found in all sewage.

It is the only material belonging to the same material-class from which your bathtub, washbowl, closet and urinal are made; and the sewer outside one's house-walls should be as clean and sanitary as the fixtures in the bath room.

Western Clay Produ ct

818 Delaware Street

at Stays Put of Opinion

Salt-Glazed Sanitary Sewer Pipe is all that perfect pipe can be; is nothing better, and indeed nothing better to be sought for.

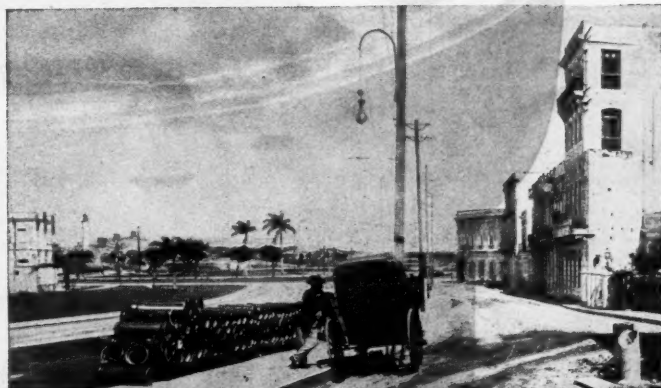
Sanitary Sewer Pipe

It is the Engineer's guarantee-bond that the sewer he has specified is permanent—and it is the insurance of perfect sewerage.

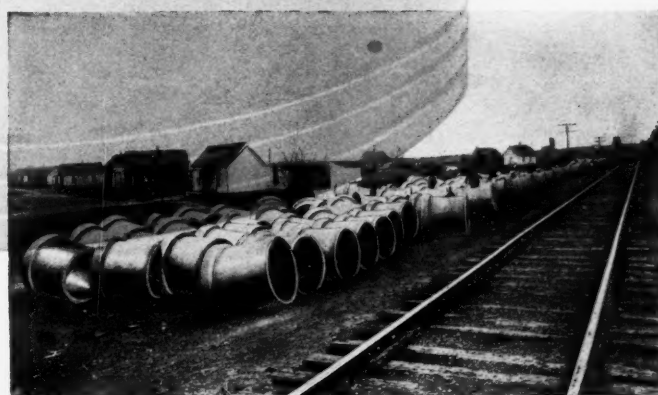
It means sewer-efficiency raised to the highest power; the efficiency of economy; efficiency in operation—complete immunity to alkali, acid and gas; efficiency in installation—readily and instantly; sanitary efficiency—a clean inside surface to which no sewage, no animal, vegetable or chemical matter can adhere; in short, being vitrified and salt-glazed, has no affinity for any known substance.

Vitrified, Salt-Glazed Sanitary Sewer Pipe

is the only sewer pipe embodying these or any of these features of sewer-efficiency.



Vitrified Sanitary Sewers, Havana, Cuba



Vitrified Sanitary Sewers from Packing Houses, Ft. Worth, Tex.

cts Publicity Bureau
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The Best and the Cheapest

THE BEST and the cheapest material on earth for sewer construction is **Vitrified, Salt-Glazed Sanitary Sewer Pipe**. This is the absolute plain fact and irrefutable. Best, for the reason that it alone does all that good pipe *can* do. Cheapest, because when you've paid for it once you're *through*; there's no "come-back"—no up-keep—no repair work—no maintenance, it comes in manufactured form and ready for instant installation.

No expense for inspection or supervision during manufacture. A glance of the eye and a tap of the hammer determines the quality. If it rings, it's right, and none of the killing, gruelling, uncertainty and suspicion about it, "What condition is it in now, do you suppose?" etc., for there is no disintegration in **Vitrified Pipe**, no change, chemical or physical, none whatever—it's there—and there forever and a day.

We have three books for you: "**Sewer Facts**" and "**Sewer Failures**"—the former a book of comparative data for the practical engineer, and the latter a "report by camera" of some mistakes in sewer-building. These books are free, post paid, on request.

The third book, "**Comparative Sewer Specifications**," taken from actual specifications in cases of special interest, and drafted by six of our prominent and experienced engineers. Free on receipt of 12 cents to help cover postage and packing.

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Public Improvements—Reducing Assessments

Camp vs. City of Davenport.—Where, on appeal from a special assessment, there is evidence that no benefit was derived and there was other evidence that the property was benefited, but there was no evidence to show the extent of the benefit conferred, it is error to reduce the assessment fixed by the City Council.—Supreme Court of Iowa, 130 N. W. R., 137.

Dumping Ground—Negligence—Liability

Brennan vs. City of Albany.—Where the defense of ultra vires is interposed by a municipal corporation to a contract obligation, it must be pleaded to be available. The liability of a principal for the act of his agent, which is beyond actual authority, can be based on apparent authority only where such apparent authority has misled the other party. Where private land was lawfully used by a city for a dumping ground, it was liable for the negligence of its employees in so piling refuse that surface water which would otherwise have escaped through a sewer flowed onto and damaged adjoining property.—Supreme Court of New York, 128 N. Y. S., 334.

Defects in Streets—Actions—Negligence

Heffern vs. Village of Haverstraw et al.—Where a city and one who excavated land near a highway were jointly sued for damages caused by the slide of the highway into the excavation, and the city's only negligence was non-performance of its duty to keep the highway in a safe condition, a finding that the one who made the excavation was not negligent necessarily exonerated the city. Where one in a place of safety, on hearing that there was a slide into an excavation with which he was familiar, went near that place from curiosity, and the land slid again, drawing down the street upon which he was standing, he was guilty of contributory negligence, barring a recovery against the city for his injuries.—Supreme Court of New York, 128 N. Y. S., 399.

Sewer Contract—Substantial Performance.

City of St. Louis vs. Ruecking et al.—The doctrine of substantial performance applies to municipal sewer construction contracts. In an action on the bond of municipal contractors, whether substitution of loose earth for sand in laying sewer pipe under a municipal construction contract was substantial compliance with the contract held, under the evidence, a jury question. Under a provision requiring a municipal sewer contractor to correct imperfect work when discovered before final acceptance, there can be no recovery by the city for defects discovered after such acceptance, in the absence of fraud or collusion. A city ratified its agents' unauthorized acts in permitting substitution of earth for sand in laying pipe under a sewer contract by accepting and paying for the work, in the absence of fraud or collusion by the agents.—Supreme Court of Missouri, 134 S. W. R., 657.

Contempt of Federal Supreme Court

Merrimack River Savings Bank, Appellant, vs. City of Clay Center et al.—The willful destruction by municipal officers of the poles and wires of a light and power company, pending an appeal to the Federal Supreme Court from a decree of a Circuit Court, dismissing a bill praying, among other things, an injunction to prevent such destruction until the right shall be determined, is, in and of itself, a contempt of the appellate jurisdiction of the Supreme Court, although such conduct may also be a violation of the temporary injunction order continued by the court below pending the appeal. The honest belief that when an appeal to the Federal Supreme Court from a decree of a Circuit Court, dismissing a bill asking injunctive relief against the removal or destruction by municipal officers of the poles and wires of a light and power company, had been dismissed and an order of dismissal entered, there was no reason why such poles and wires should not be removed or destroyed, although not sufficient to acquit of a technical contempt of court where no mandate had issued or could have issued under the rules of the Supreme Court, may reduce the punishment to the payment of the costs of the contempt proceedings.—31 S. C. R., 295.

Icy Sidewalk—Injuries

Ballard vs. Village of Hamburg.—A municipal corporation is not liable for injuries caused by an icy sidewalk, unless it is shown that the injuries were caused by hummocks or ridges of ice which had accumulated and were then permitted to remain for some time after the weather was such as to permit their removal.—Supreme Court of New York, 128 N. Y. S., 325.

Public Parks—Land Condemnation

Lake Shore & Michigan Southern Railway Company vs. City of Whiting.—Since Laws 1905, providing for the condemnation of land for public parks, provide that the repealing provisions shall not affect pending proceedings, but that they shall be concluded and judgment rendered, Laws 1905, giving a right of appeal from an interlocutory order appointing appraisers, would not authorize an appeal from an order appointing appraisers in proceedings to condemn land for a public park, where the appraisers were appointed and had filed their report more than a year before Laws 1905 became effective.—Supreme Court of Indiana, 94 N. E. R., 326.

Patrolmen—Dismissed—Action for Salary

Dolan vs. City of Louisville.—A city board of public safety may not dismiss a patrolman for conduct unbecoming an officer, alleged to have been committed two years prior to his becoming a member of the force. In an action by a patrolman to recover salary for the year subsequent to his illegal removal from the force, the burden is on him to establish his title to the office against the person succeeding him therein, or show that the office remained vacant during the year, and that the salary was not paid to any other person, or that he instituted proceedings against the Board of Public Safety for reinstatement. In an action for salary of a patrolman for the year succeeding his wrongful discharge, evidence held insufficient to show that there was a vacant place on the police force during the period sued for.—Court of Appeals of Kentucky, 135 N. W. R., 272.

Ordinances—Passage—Validity

Elliott vs. Monongahela City et al.—A municipal corporation can only exercise such powers as are granted it by the State, and only in the manner prescribed in its charter or by act of the Legislature creating it. The Monongahela city charter vests the corporate powers of the city in a Mayor and City Council. Section 62 provides that the Council shall be composed of the Select and the Common Council. Section 67 provides that a majority of each Council shall be a quorum. Section 68 provides that they may, when convenient, hold joint sessions, and section 69 provides that no appropriation of money and no ordinance shall be of any force unless concurred in by the Councils. Held, that an ordinance authorizing the city officials to contract for lighting and fixing the price to be paid for such service passed at a joint session by a majority of the collective body, but, failing to receive the approval of the majority of one of the branches separately, is void.—Supreme Court of Pennsylvania, 79 A. R., 144.

Contract for Public Work—Substantial Performance

St. George Contracting Company vs. City of New York.—The plaintiff had a contract with the city for excavation, which provided that all top soil and hardpan should be deposited as filling back of the completed wall, and that, should there be an excess of excavated material, the contractor should remove it at his own expense. After the contract was signed, and before plaintiff began work, a railroad company by mistake entered upon, excavated and carried away top soil amounting to about one-tenth of the measurement called for by plaintiff's contract, and the city on completion of the contract refused to pay plaintiff for this amount. Plaintiff, in an action to recover therefor, offered no proof that the material carried away was excess material not needed for filling. The evidence of the city tended to show that it had to purchase filling to back the wall, and plaintiff's evidence tended to show that defendant's damage thereby was only nominal. Held, that plaintiff had not sustained the burden of proving substantial performance, and had no case against the city.—Supreme Court of New York, 128 N. Y. S., 393.

MUNICIPAL APPLIANCES

STEEL REINFORCEMENT FOR CONCRETE SEWERS

The general argument in favor of the use of steel as a reinforcement for concrete is as follows: The compressive resistance of concrete is about ten times its tensile resistance, while steel has about the same strength in tension as in compression. Volume for volume steel costs about fifty times as much as concrete. For the same sectional areas steel will support in compression thirty times more load than concrete, and in tension three hundred times the load that concrete will carry. Therefore, for duty under compression only, concrete will carry a given load at six-tenths the cost required to support it with steel. On the other hand, to support a given load by concrete in tension would cost about six times as much as to support it with steel.

In sewer construction the exact value of reinforcement cannot be stated in general terms applicable to all cases. The amount of the load on the sewer and stresses developed in different parts of the ring depend upon a number of conditions, among them the nature of the earth used in filling, the method of bedding the pipe, the way of tamping the earth on the pipe. Moreover, a sewer may be under pressure or may be so located as to need special strengthening. The question of whether a sewer requires reinforcement or not, and if so, what kind, has to be left to the engineer to work out in each instance.

The reinforcement for sewers may consist of circumferential rods in the form of hoops or spirals. Longitudinal rods, either inside or outside the hooping, depending upon whether the pressure is from within or without, and wired to the hooping, are often employed. Various forms of netting and expanded metal are also extensively used.

Steel imbedded in properly proportioned and mixed concrete is believed to be practically indestructible by such agencies as it is exposed to in a sewer. This fact has been demonstrated in a series of tests by Professor Norton, Massachusetts Institute of Technology. He advises the use of thoroughly mixed wet concrete.



ROUND, SQUARE, SPIRAL AND TWISTED BARS

BANDS, SQUARE AND ROUND RODS

While the adhesion between iron and steel is considerable, it may be weakened by various agencies, such as water; consequently some sort of mechanical bond is generally preferred. This is secured by making the bars of special shapes, as by the use of corrugations or twisting. Hence the plain bands and square and round rods have a limited use. Some engineers have objected to the use of square or flat sections on the ground that the sharp re-entering angles formed in the concrete weaken it and induce cracks to start from the angle when subjected to loads or shocks.

In selecting steel for sewer reinforcement not only the form of the steel, but its quality has to be considered. In the following account of the manufactures now on the market substantially the argument of the maker is presented in each case.

Plain steel bars, flat, square and round, are made by all manufacturers of steel. They have a limited use in sewer construction. Flat bars are, however, often used in the construction of sewer pipes which are made before they are put in place, as in Jackson pipes. Authorities differ as to the quality of steel to be used for reinforcement, soft, medium and high-carbon steel being used by different engineers. According to Homer A. Reid, the preference seems to be for soft or medium steel. Open hearth steel is preferable to Bessemer. Open hearth steel, either acid or basic, should conform to the following requirements: The maximum limit of phosphorus in the finished material should not exceed .07 per cent for acid and .05 per cent for basic open hearth steel. Soft steel should have an ultimate strength of from 54,000 to 62,000 pounds, and an elastic limit of not less than one-half the ultimate strength; it should elongate 25 per cent in 8 inches, and bend cold 180 degrees flat on itself without fracture on outside of bend. If medium steel is used, it should have an ultimate tensile strength of from 60,000 to 68,000 pounds per square inch, an elastic limit of not less than one-half the ultimate strength, and should elongate not less than 22 per cent in 8 inches, and bend cold 180 degrees around a diameter equal to the thickness of the piece tested, without fracture on outside of bend. If high steel is used it should have a tensile strength of 100,000 pounds per square inch, and an elastic limit of not less than one-half the ultimate strength, and should elongate not less than 10 per cent in 8 inches for a test piece $\frac{3}{8}$ to $\frac{3}{4}$ inch in diameter. A test piece $\frac{1}{2}$ inch in thickness should bend 110 degrees without fracture around a diameter equal to its thickness.

REINFORCING BARS

Twisted Bars.—Steel bars twisted cold are the invention of E. L. Ransome. Square bars are usually employed. The twisted form gives a firm grip on the concrete, thereby greatly assisting the adhesion between the two materials. The process of cold twisting also cleans the bar by removing scale, thus increasing its adhesion to concrete. Square bars may be twisted on the work by a simple apparatus. The operation of twisting the rods cold modifies the qualities of the metal, raising the elastic

limit and ultimate strength. Half-inch bars generally have three twists per linear foot.

The Inland Steel Company makes cold twisted medium open hearth steel billet bars in 60-foot lengths. Their elastic limit is given as 55,000 to 60,000 lbs. per sq. inch. Sizes run from $\frac{3}{8}$ inch to $1\frac{1}{2}$ inch. The company controls the manufacture of its product from ore to finished bar. The same company makes hot twisted, high elastic limit, rail-carbon bars in 10 to 40-foot lengths. The elastic limit is given as 50,000 pounds or over. These bars have one twist in eight diameters of the bar.

William B. Hough Company manu-

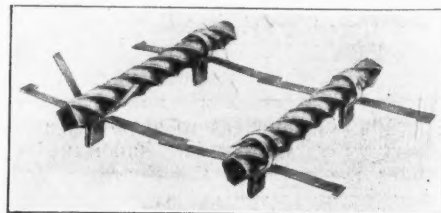


HOUGH SPECIAL METAL TWISTED BAR

factures the M/B cold twisted steel bar having an elastic limit of 60,000 pounds yet capable of being bent double when cold. The high elastic limit and great ductility of these bars are said to be due to the fact that they are made from a special open hearth steel. High elastic limit in ordinary steel is obtained only by the presence of a large percentage of carbon, the result of which is brittleness. The percentage of carbon in the M/B bar is not high.

Jones and Laughlin Steel Company also manufactures cold twisted bars and control the manufacture from ore to finished product. The elastic limit of these bars is stated to be 60,000 pounds and they will bend around a diameter three times the size of the section. The effect of twisting in improving the qualities of the bar is well illustrated in a series of tests given in one of the company's pamphlets. The data regarding the tests of a $\frac{3}{8}$ -inch bar are quoted: Elastic limit, before twisting, 39,130; after twisting, 71,160; increase due to twisting, 82 per cent; tensile strength before twisting, 61,180; after twisting, 85,380; increase due to twisting, 39 per cent. Attention is called to the fact that in twisted bars a greater variety of sizes is available than in the case of any other concrete bar. The company manufactures all sizes from $\frac{1}{4}$ inch to $1\frac{1}{2}$ inch, increasing by sixteenths, in lengths up to 40 feet.

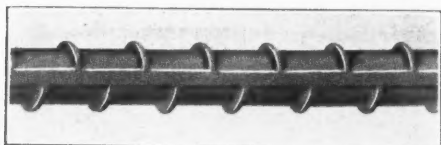
The Hough company makes a spacer called Securo, which accomplishes three purposes. It holds the bar in position at the correct distance from the surface of the shell; it locates the bar evenly and accurately at the specified distances from center to center. The prongs of the spaces when bent over the bar clasp it in a viselike grip, leaving positively no chance for slipping or sliding.



SECURO SPACER

The Buffalo Steel Company makes twisted bars besides special shapes described later. The company states that the elasticity is neither rolled nor twisted into their bars. It is in the steel, they say, and heating to forge, to bend or shape will not alter it. The twisting is done as the finished bars come from the rolls. Enough heat remains to allow the full mechanical effect of twisting without destroying the homogeneity of the steel. The process is claimed as a specialty.

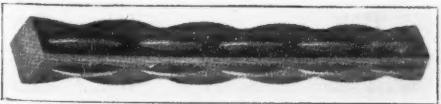
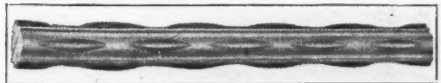
Shaped Bars.—The Corrugated Bar Company manufactures square bars with corrugations on all four sides and round bars also with corrugations. The square bar of this type was developed in 1898 and the round bar only a few years ago. The round bar has the advantage of the greatest possible flexibility; its shape allows of bending being done without the use of special machinery or particular preparation. These bars are rolled in medium, soft or high



ROUND AND SQUARE CORRUGATED BARS

carbon steel. The company furnishes, upon special order, bars made from "rail carbon" steel. These bars are made from railroad rails, the rail being split and the head rerolled into the finished bar. Material of this type is, of course, subject to irregularity in chemical and physical characteristics due to the fact that the raw material is secured from a number of sources. However, owing to improvements in the manufacture of rails the rail carbon bar is a material much superior to that rolled a few years ago and is perhaps equal to much of the billet stock material sold for commercial purposes.

The Concrete-Steel Company makes the Havemeyer bars which have been designed to meet the requirements of mechanical bond and at the same time the important economical requirement that in the deformation no strength or metal is wasted. The deformations are so designed that a constant cross-sectional area is maintained. The square bar has a series of projections and depressions in conjunction with the plain square section of the bar, the projections on the sides equaling the depressions on the corners. The round bar has projections staggered on alternate faces, giving the same result. The pro-



ROUND AND SQUARE HAVEMEYER BARS

jections and depressions are rolled longitudinally with the bar. The absence of sharp angles, which tend to break the concrete, is claimed as a special merit. The bars may be rolled from any merchantable quality of steel. Unless otherwise specified they are rolled from high-grade, new billet steel, having an elastic limit of 50,000 to 65,000 lbs. per square inch.



RECTANGULAR RABBIT BAR—HAS NO SHARP CORNERS

The Buffalo Steel Company, in addition to the bars heretofore mentioned, makes spiral and rabbet bars. They have round corners, insuring the concrete from splitting, and a greater superficial area than square twisted bars, giving greater adhesion. Rabbet steel bars, with their corrugations and well balanced cross sections, have a greater transverse strength than plain bars.

SHEET REINFORCEMENT

Expanded Metal.—Expanded metal invented by J. F. Golding is a form of reinforcement in which a perfect union exists between the longitudinal and transverse systems of rods. It is a meshwork formed from a sheet of soft steel by slitting and opening or expanding the metal with meshes in a direction normal to the axis of the sheet. It is necessary to use a soft steel of very high quality in its manufacture, as only the highest quality of metal will stand without rupture the process of expanding, which stretches the sheet to a width of from three to eight times its original dimensions. It is manufactured in sheets 8 feet long and from 12 to 72 inches wide. Steel from No. 27 gauge, with $\frac{3}{8}$ -inch meshes, up to No. 3 steel, with meshes 5 inches by 12 inches, is used in the manufacture of expanded metal. The mesh most frequently used in sewer work is 3-inch mesh, No. 10 gauge steel.

The following table gives the data regarding standard expanded metal mesh.

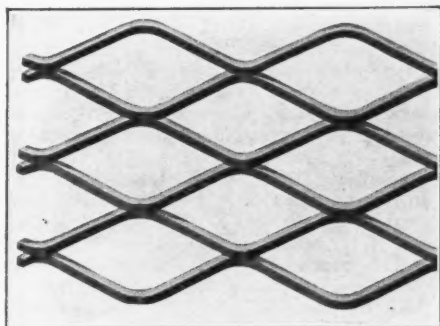
Mesh	Designation or		Size of Mesh.		Section in Sq. Inches Per Foot of Width.	Weight per Foot in Pounds.
	Gauge (Stub).	Standard or Extra.	Width of Diamond.	Length of Diamond.		
3"	No. 16	Standard	3.0"	8.0"	.083	.28
3"	" 10	Light	"	"	.148	.50
3"	" 10	Standard	"	"	.178	.60
3"	" 10	Heavy	"	"	.267	.90
3"	" 10	Ex. Heavy	"	"	.356	1.20
3"	" 6	Standard	"	"	.400	1.38
3"	" 6	Heavy	"	"	.600	2.07
4"	" 16	Old Style	3.86"	6.85"	.093	.42
6"	" 4	Standard	6.0"	16.0"	.245	.84
6"	" 4	Heavy	"	"	.368	1.26

Expanded metal as described is made by a number of companies joined in the Association of Expanded Metal Companies. They include the Northwestern Expanded Metal Co., Chicago; Central Expanded Metal Company, Pittsburgh; Eastern Expanded Metal Company, Boston; Expanded Metal Engineering Company, New York; St. Louis Expanded Metal Fireproofing Company, St. Louis; Southern Expanded Metal Company, Washington, D. C.; Merritt & Company, Philadelphia; Buffalo Expanded Metal Company, Buffalo; Expanded Metal Fire-

proofing Company, Pittsburg; Western Expanded Metal and Fireproofing Co., San Francisco, and the Expanded Metal and Fireproofing Co., Limited, Toronto, Ontario.

In sewer construction expanded metal should be placed with the length of the diamond on the circumference. It has been placed in a number of sewers with the diamonds parallel with the bore, but such reinforcement is not economical. The following table contains data for the proper use of expanded metal in sewer construction:

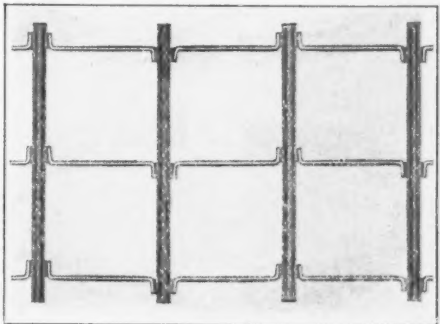
Inside Diameter.	Thickness of Concrete.	No. of Expanded Metal.	Inside Diameter.	Thickness of Concrete.	No. of Expanded Metal.
2' 6"	3"	15-3	5' 0"	4"	30-3
3' 0"	3"	20-3	5' 6"	4½"	30-3
3' 6"	3"	20-3	6' 0"	5"	35-3
4' 0"	3"	25-3	6' 6"	5½"	35-3
4' 6"	3½"	25-3	7' 0"	6"	40-3



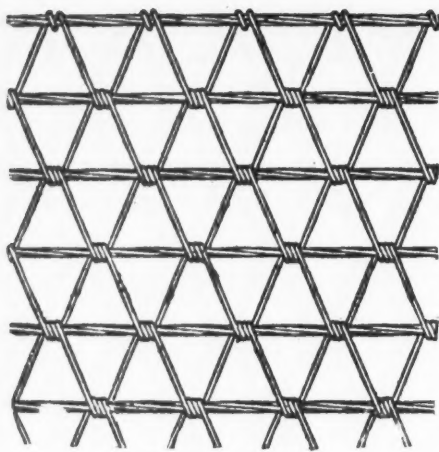
EXPANDED METAL

Special Sheet Reinforcement.—Rib metal is made by the Trussed Concrete Steel Co. It consists of a series of straight ribs or main tension members rigidly connected by light cross ties formed from the same sheet of steel. The main ribs are in the direct line of the greatest strain, while the cross members thoroughly reinforce the concrete against shrinkage or settlement cracks. The material is supplied by the manufacturer in either straight or curved sheets to meet every possible condition of sewer construction. Accuracy of curves is assured, as the sheets are machine bent. Owing to its rigidity and stiffness rib metal stays in the forms where placed and cannot be dislodged in the pouring of the concrete. The large open mesh permits the concrete to be readily tamped on all sides of the steel.

Triangle mesh reinforcement is made by the American Steel and Wire Company. It is used by those companies manufacturing reinforced concrete pipe which is made alongside the work and after the concrete is set lowered into



RIB METAL



TRIANGLE MESH

the ditch. These companies are the Lock Joint Pipe Company, the American Concrete Company and the Reinforced Concrete Pipe Company.

Triangle mesh woven wire reinforcement is made with either solid or stranded longitudinal members, properly spaced by means of diagonal or cross wires so arranged as to form a series of triangles between the longitudinal or tension members, the longitudinal members being invariably spaced 4 inches apart, the cross wires either 2 inches or 4 inches, as desired, providing either a 2-inch or 4-inch mesh. The wires are of cold drawn steel, possessing, it is stated, from 25 to 60 per cent greater tensile strength than hot rolled products of the same area. The longitudinal members may consist of one, two or three wires in the following sizes: Nos. 4, 5, 6, 8, 10 and 12½, or a ¼-inch wire used singly. Cross wires are either 12½ or 14 gauge on 2-inch or 4-inch centers, and the material is regularly supplied in widths from 18 inches to 58 inches, varying by steps of 4 inches and in rolls 150, 300 or 600 feet in length.

The Unit System of Reinforcing is made by the American System of Reinforcing, Chicago, Ill. This high tensile steel fabric is made of special steel claimed to have twice the tensile strength of any other woven material on the market. It is ductile enough to wrap around itself three or four times. Adjoining widths of fabric are fastened together by hooks. This makes it unnecessary to overlap the fabric. The

following gives the result of tests of Unit fabric made by Prof. A. N. Talbot:

	Area Sq. In.	Ultimate.	Elong. Limit, Sq. In., Lbs.	Ultimate Sq. In., Lbs.
On 8 tests on No. 9 wire, average.	.017	2450	124,000	146,000
On 8 tests on No. 11 wire, average.	.010	1230	118,000	140,000

The American company calls attention to the fact that their reinforcement affords more surface to the concrete grip than large rod reinforcement.

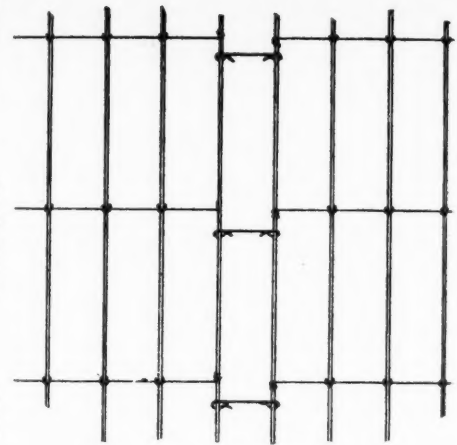
FLUSHING TANKS

The Pacific Flush Tank Company, Singer Building, New York, N. Y., has employed in the past three methods of flushing two or three lateral sewers from one tank. The first uses a single standard Miller siphon dividing the discharge outside the tank by a V branch or double Y branch into two or three streams as the case may be: The second employs a single special Miller siphon which discharges contents of tank directly into a manhole and flushing the two or three laterals converging into same: The third method uses a two-way discharge Miller siphon located in a flush tank, the siphon having a discharge head with two outlets. As the water in each of the above methods is used to flush the two or all three sewers at the same time, each tank must be two or three times the capacity of a flush tank to flush a single sewer.

A fourth method is the latest and best and does not require any larger tank than a single flush tank, as the different sewers are flushed in rotation, each lateral receiving in its turn the entire contents of the tank. To accomplish this, two or three (as the case may be) Miller-Adams alternating siphons are set into one tank, each siphon being connected with its respective sewer. The accompanying illustration shows the triple alternating design. In this device the bells and traps are so arranged as to allow them to flush in rotation.

STARY TANK

F. Stary & Sons, Cedar Rapids, Ia., manufacture an automatic siphon for use in connection with a sewer flush tank. It consists of but three plain castings, the discharge limb and trap, the cap with a relief trap cast integral



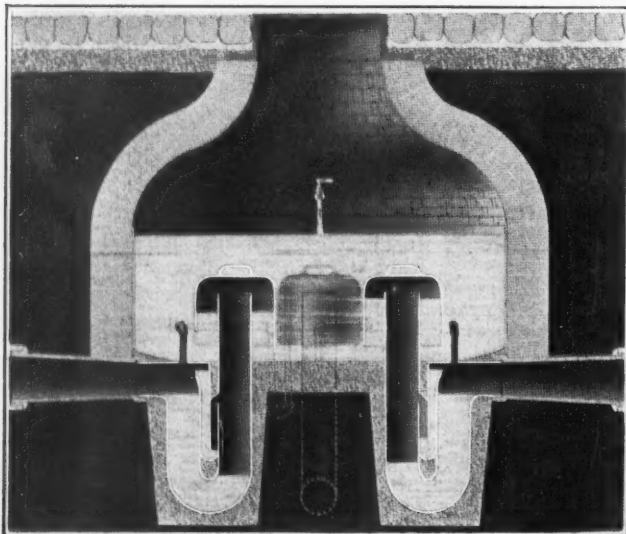
THE UNIT SYSTEM

therewith, and the intaking limb or bell. It has no moving parts and no joints. The siphon is sealed by filling the trap with water. When the water entering the tank rises above the level of the lower edges of the intaking limb or bell the air within becomes enclosed. A continued rise of the water in the tank compresses the air confined within the siphon and this compression gradually forces the water from the traps until the water in the tank has reached sufficient depth to draw the liquid seal, whereupon the confined air suddenly escapes and the water from the tank rises in the bell bringing the siphon into full action. The water is then drawn out of the tank to a level with the lower edges of the bell, the siphon is reverted by admission of air through the shallow relief trap and the operation is repeated.

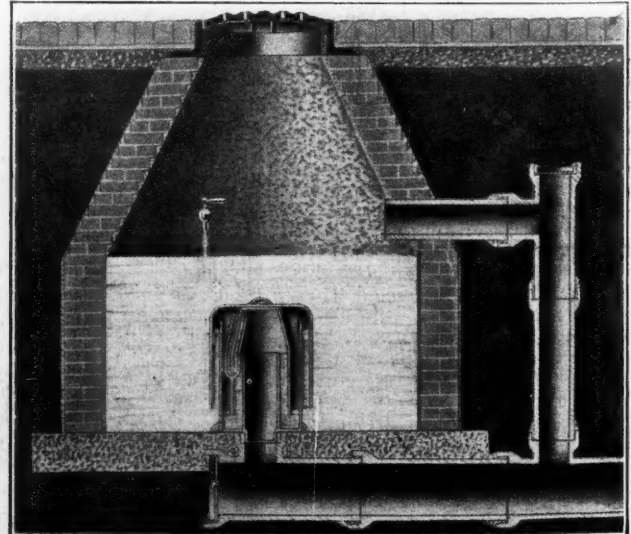
The instructions for installing the flush tank, as given by the company, are as follows:

The excavation for the tank shall be opened so that the last pipe laid in the line of sewer, which may be either a T branch, ¼ curve, or a tapped length of straight pipe, shall form an outlet from the center of the bottom of the tank. This outlet shall be of sufficient size to receive the siphon outlet.

The floor of the tank is laid to a level with the outlet from the tank, the walls are built up and plastered both inside and outside with cement mortar and the supply pipe, vent pipe and iron steps are built into the wall each at its proper place. After hardening of the plaster the walls and floor



MILLER-ADAMS TRIPLE AUTOMATIC SYPHON FLUSH TANK



STARY AUTOMATIC SYPHON FLUSH TANK

of the tank will be coated with thick cement slush applied with a brush so as to make the tank absolutely water tight.

The siphon may be installed either during the construction of the flush tank or after the tank has been completed.

To install the siphon, a light bed of cement mortar is formed around the outlet from the tank and the trap of the siphon is placed upon this bed so that the outlet of the discharge leg shall enter the outlet from the tank. The discharge leg is made level by placing a spirit level on top of the trap and leveling it both ways. Cement mortar is then built up around the trap and care shall be taken that the trap is not disturbed until the cement has set sufficiently to hold it in place. After hardening of the cement the trap shall be filled with water, the cap placed over the discharge leg and the bell placed over the trap. Water may then be supplied and the tank put into operation.

PORTABLE GASOLINE DERRICK

A PORTABLE gasoline derrick called the Wonderhoister has been placed on the market by W. Van R. Whitall, Inc., 30 Church street, New York, N. Y. It consists of a direct connected gasoline engine and hoist with single or double drums mounted on a portable truck. The whole device is simple, compact, portable and economical, built of steel throughout, with either steel or wooden mast and booms.

The builder states that the machine is so constructed that it is adaptable for all hoisting purposes. It operates at a speed of from 75 to 150 feet per minute, and is arranged for use with a simple bucket or with a plain hook for ordinary hoisting; also with a drum and counterweight for operating with a clamshell bucket, and with a bull wheel on the mast for self-swinging. The "Wonderhoister" is also adapted to conveying, hauling, excavating and unloading purposes. It is used by contractors for handling concrete, sand and gravel in connection with sewer work and other construction. When not in operation with the derrick the engine is available for furnishing power for general purposes, such as running air compressors or small pieces of machinery.

STEEL SHEET PILING

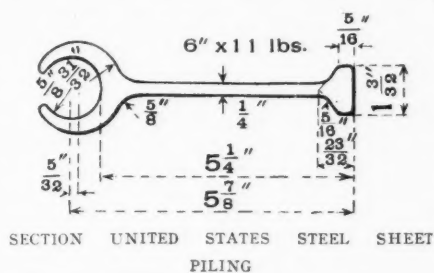
Immediately after the introduction of steel sheet piling, in November, 1901, when it was first used in the construction of the cofferdams for the Randolph Street Bridge, Chicago, its advantages in sewer and trench work, by reason of the possibilities of its indefinite reuse, were instantly recognized.

There are manufactured a number of sections which are suitable for sewer and trench work, in which case much lighter sections can be used than those required in cofferdam construction and deep foundations where the depth of penetration is great and the driving conditions difficult. In city sewer and trench work the driving is usually through loose ground to shallow depths, and heavy sections are not required. Sections are therefore, made light in weight, particularly adapted to his class of work.

The driving of steel sheet pil-

ing in sewer and trench work is exactly similar to that followed in driving wooden sheeting. Any form of light pile driver may be used, and the greatest economy is obtained when the piling is driven by a driver arranged to move on rollers along the line of the excavation as the work progresses. A 200-pound hammer operated by gas, steam or compressed air will drive light sections through ordinary soils up to 10 or 12 feet penetration. It has also been driven with a wooden dolly dropped from a tripod, by mauls, etc. It is desirable to use some form of driving cap to protect the heads of the piling from battering in order to permit reuse as often as possible without the necessity of straightening the material at the tops to prevent the binding of the sections in the interlock.

The most economical way to handle the work is to provide steel sheet piling for a convenient section of trench of such length that as the work pro-



gresses the piling at the rear may be pulled and driven ahead, which means that the operations of driving, excavating, placing the sewer and backfilling are to go on continuously, the initial operation being carried on at the pile driver and the final operation at the rear of the excavation where the piling is pulled. Generally a hundred-foot length should be sufficient.

Steel sheet piling, being much stiffer than the ordinary 2-inch planking, there is less necessity for bracing, and it is possible to use safely only extensible trench braces and to omit the rangers, depending of course on the depth of the trench. In this way both the transverse and the longitudinal strength of the piling may be utilized, the sections taking a catenary curve between the

braces and, therefore, resisting the earth pressure both as beams and as arches.

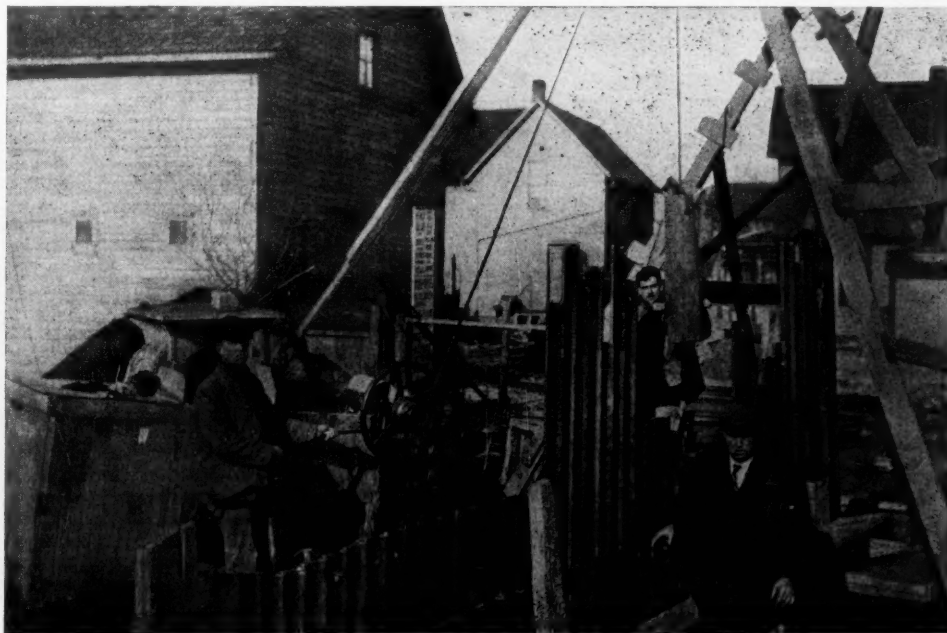
The number of times that steel sheet piling may be driven, pulled and re-driven is unknown. The largest number of times recorded in available records in any installation is 80, and the piling was reported to be just as good after the installation was completed as it was when it started.

In the construction of the Colonial avenue and Jamestown boulevard, at Norfolk, Va., in 1907, 6-inch 11-lb. United States steel sheet piling was driven 35 times with a 200-pound gas hammer in building 7,000 feet of trench. The piling was driven in quicksand and withdrawn with a tripod and horse, at a saving of about 40 per cent as compared with the cost of wooden sheet-piling.

In 1908 a trench 5 feet wide, 12 feet deep and 700 feet long, was excavated in sand, gravel and quicksand for the blast furnace of the Wickwire Steel Company, on the Niagara River, near Buffalo, N. Y. Enough 12-inch piling 16 feet long was bought for a trench 70 feet in length and was driven with a 2,800-pound drop hammer at a cost, including material, driving and pulling, of about \$3,300, as compared with an estimated outlay of \$4,200 for wood, and after the job was completed the steel sheet piling was inventoried by the contractor at \$1,400. The total saving was 48 per cent.

Some extremely low driving costs have been made in sewer work, as low as 3½ cents per foot of penetration, and experience amply demonstrates the value of piling as a modern up-to-date tool of construction.

The illustration shows 6-inch 11-lb. United States steel sheet piling driven by a wooden dolly falling from a tripod in the construction of a sewer at the city of Flint, Mich., by a A. P. Southworth. Two thousand lineal feet of sewerage was built in 60-foot sections. The sections were driven about 35 times each at a cost for driving and pulling of 25 cents per lineal foot of trench for 10-foot lengths, and \$1 per lineal foot of trench for 20-foot lengths, through considerable quicksand and in water, the longer lengths being used through the quicksand.



DRIVING UNITED STATES STEEL SHEET PILING WITH WOODEN DOLLY

NEWS OF THE SOCIETIES

Third National Conference on City Planning.—Count Heinrich von Bernstorff, the German Ambassador to the United States, will be Philadelphia's guest and the principal speaker at the dinner to be given at the Bellevue-Stratford, May 17, to the members of the Third National Conference on City Planning. The dinner, which will be the closing feature of the three days' City Planning Conference, was originally arranged for 100 guests, but so great has been the interest in the conference that more than 600 men and women have already expressed a desire to attend. The invitations have been extended jointly in the name of the Mayor and the City Club.

The programme for the conference is being completed and the committee is now devoting its time to the exhibit which will be a popular feature of the conference. This will be the first municipal exhibit of city planning held in the United States under the auspices of a municipality.

The exhibition will be open to the public from May 15 to June 15, daily, between the hours of 10 a. m. and 10 p. m., and on Sundays between 1 and 5 p. m. The exhibits will be shown in the Mayor's reception room in the large conversation hall on the second floor of the City Hall, directly facing the north staircase, the Board of Education's main room and the north, east and west corridors on the second floor. The exhibition will be specially lighted by the Electrical Bureau.

More than 100 cities, including Paris, Berlin, Liverpool and other foreign municipalities, will be represented in the exhibition. In the London exhibit will be drawings of Piccadilly Circus. Through the efforts of the Commercial Museums a large collection of photographs will show harbor improvements in Havana, Rio de Janeiro and Buenos Ayres.

New York City will be represented by a large collection of plans prepared in 1907 by the New York Improvement Commission, showing dock and street improvements. These plans are all in perspective and are owned by the city of New York. Included in the plans will be a number of bridge improvements and the design, in perspective, for the Hudson-Fulton Memorial Water Gate.

Chicago will show plans which were prepared for the Commercial Club by D. H. Burnham and D. H. Bennett. About \$60,000 was spent in the production of these plans and about \$20,000 additional was expended on the preparation of the report, which has just been issued. This exhibit will be made by the Commercial Club of Chicago, and it will occupy the entire space in the Board of Education's main room. The plans in themselves show a linking up of all the territory within a radius of 75 miles of Chicago.

Philadelphia's exhibit will be the recently designed comprehensive plans, which will be shown in the Mayor's office.

Boston, which has officially appropriated \$1,500 to make an exhibit, will show many drawings illustrating projected improvements, together with designs for the Boston Exposition of 1915. Included in the Boston exhibit will be drawings showing the new park system, generally admitted to be the most magnificent park area in the United States. Cleveland will be represented

by a large number of original drawings showing improvements. The Chamber of Commerce is supervising the improvement work in Cleveland.

Baltimore will have a large exhibit showing the municipal activity started in that city, together with many drawings showing future development.

The Pittsburgh exhibit will be largely made up of the report, just published, showing projected improvements for the remodeling of the city streets so as to meet the traffic demands of the rapidly increasing population. The report was designed by Frederic Law Olmstead, chairman of the executive committee of the City Planning Conference, and one of his recommendations to the city of Pittsburgh is the creating of a magnificent park at the point where the two rivers join the Ohio and where Fort Duquesne was located. From that point the city of Pittsburgh had its beginning.

Other American cities which have arranged exhibits include Buffalo, Milwaukee, Washington, Minneapolis, Jersey City, Seattle, Rochester, St. Paul, Denver, Portland, Ore.; Columbus, Ohio; Toledo, New Haven, Scranton, Hartford, Des Moines, Kansas City, Wilkes-Barre, Savannah, San Diego and Los Angeles.

A general invitation will be extended to the public, and special days will be set apart for schools, organizations, societies, etc., to view the exhibits. It is probable that the offer of a number of university students to act as volunteer lecturers and guides will be accepted.

International Association of Municipal Electricians.—Secretary Clarence R. George, Houston, Tex., has announced that the annual convention will be held in St. Paul, Minn., September 12-15.

American Society of Mechanical Engineers.—Several important papers on patents will be presented at the New York meeting of the American Society of Mechanical Engineers, 29 West Thirty-ninth Street, at 8:15 p. m. on Tuesday, May 9, 1911. The subject will be discussed by E. W. Marshall, D. Howard Haywood, Edwin J. Prindle, all of New York. The purpose of this meeting is to outline to the engineer and manufacturer the fundamental principles of the patent law, the position and qualifications of a patent expert and the industrial development for the purpose of establishing a patent monopoly. The question of patent law is more a question of pure and applied science than it is of law and for this reason this subject interests engineers and all those trained in the mechanic arts. There are few legal practitioners who even pretend to have sufficient knowledge of patent law to practise in this field successfully and the experts who are to discuss the papers are by experience professionally conversant with the particular branch of the subject of which they treat.

Good Roads Association of Western Kentucky.—Over 200 citizens of six counties in Kentucky met at Middlesboro April 10 to attend a good roads convention. The convention was called to order by County Judge B. A. Fuson. Mayor Helburn, Middlesboro, delivered the address of welcome. Among the speakers were John W. Chalkley, Big Stone Gap, Va.; J. F. Bosworth, Middlesboro; T. J. Stewart, Winchester, and Ruby Lafoon, Madisonville. One of the objects of the meeting was to promote the construction of a road from Virginia to the Blue Grass region.

Playground Association of America.—The fifth annual meeting will be held

at the New Willard Hotel, Washington, D. C., May 10-13. The following is the program:

Wednesday, May 10, 8:00 p. m.—Rural Recreation, Professor L. H. Bailey, Cornell University, Ithaca, N. Y., Chairman Committee on Rural Recreation; Hon. William Kent, Kentfield, Cal.

Thursday, May 11, 9:30 a. m.—Games for Children under Ten Years of Age, Alice Corbin, Pittsburgh Playground Association. Demonstration, George E. Johnson, Superintendent Pittsburgh Playground Association. 10:45 a. m.—Games for Girls Ten to Fourteen Years of Age—Discussion by playground experts. Demonstration, George E. Johnson, Superintendent Pittsburgh Playground Association. 12:00 m.—Playground Equipment, E. B. DeGroot, General Director South Park Commissioners, Chicago, Ill.

Thursday, May 11, 2:30 p. m., Rosedale Playground, 17th and Kramer Sts., N. E.—Games for Boys Ten to Fourteen Years of Age, George E. Johnson, Superintendent Pittsburgh Playground Association. Delegates will themselves play volley ball, playground ball, soccer football. The teams will be captained by George E. Johnson and E. B. DeGroot. The leading playground workers have agreed to play on these teams. There will also be a volley ball game for young women delegates. 8:00 p. m.—Play as an Antidote to Civilization, Joseph Lee, President Playground Association of America, Boston, Mass.

Friday, May 12, 9:30 a. m.—What About Athletics on the Playground, Lee F. Hammer, Chairman Committee on Institutes, Playground Association of America, New York City. 10 a. m.—Pay Leaders and Boy Scout Activities, James E. West, Secretary Boy Scouts of America, New York City. 10:30 a. m.—Sources from Which Recreation Workers May Be Secured, Clark W. Hetherington, Chairman Committee on Normal Course in Play, Chicago, Ill. 11 a. m.—The Guild of Play, Madeline L. Stevens, Play Supervisor Parks and Playgrounds Association of New York City. 11:30 a. m.—Question Box—Questions answered by leading playground experts. 2:30 p. m.—Possibilities of Dramatic Work—Demonstration, Edna V. Fisher, Pittsburgh Playground Association. 3:30 p. m.—Folk Dancing, Mrs. James J. Storrow, Chairman Committee on Folk Dancing, Boston, Mass. 4:30 p. m.—Folk dancing by delegates. 8 p. m.—Boys and Girls at Night—Speaker to be announced. Evening Recreation—Social Dancing, Mrs. Charles Henry Israels, Committee on Amusements and Vacation Resources of Working Girls, New York City. Active Games—Discussion by playground experts.

Saturday, May 13, 9:30 a. m.—Practice of Boy Scout activities by delegates. Boy Scout Patrols on the Playground, Preston G. Orwig, Field Secretary, Boy Scouts of America. 1 p. m.—An invitation to delegates has been extended by Mr. Arthur C. Moses, President of the Washington Playground Association, to be his guests at a luncheon at the Neighborhood House Social Settlement, 472 N Street, S. W., at 1 p. m. Following this there will be an opportunity to inspect the Settlement playground and witness a part of the Settlement's Annual Spring Festival. Small parties will be arranged to go from the Settlement to visit the other playgrounds.

American Society for Testing Materials.—The fourteenth annual meeting of the American Society for Testing Materials will be held at the Hotel Traymore, Atlantic City, N. J., Tuesday to Saturday, inclusive, June 27 to July 1. This year it is expected that most of the papers and committee reports will be printed and circulated in advance of the meeting. The present membership of the society is 1,342.

Syracuse Commission Government Association.—As the result of agitation which has been carried on for some time a number of citizens have formed the Syracuse Commission Government Association for the purpose of disseminating information regarding this system of municipal administration. Officers have been elected as follows: President, Giles H. Stilwell; vice-president, Thomas W. Meacham; treasurer, W. C. Brayton; secretary, Virgil H. Clymer. The following were placed on the executive committee: Louis Will, Hurlbut W. Smith, Charles W. Snow, Carlton A. Chase, J. Brewster Gere, Salem Hyde and Robert Dey.

Health Officers of Central New York.—A sanitary institute for the benefit of health officers of central New York was held at Syracuse, May 2 and 3. The following program was carried out:

First session, May 2, 2-5 p. m., held in the Municipal Laboratory, City Hall, Syracuse.

2-3—Laboratory demonstrations by laboratory staff. How to collect samples of water. The taking of specimens from throat for examination for diphtheria infection. The taking of blood for examination of typhoid infection. Collection of stools—specimen. Laboratory methods of examination.

3-4—Brief talks, Dr. W. W. White, "The Work of Municipal and County Bacteriological Laboratories"; Dr. F. E. Englehardt, "Local Laboratory Control of Water Supplies"; Dr. W. A. Bing, "Bacterial Diagnosis by the State Laboratory"; L. M. Wachter, "State Investigation of Water Supplies"; Dr. W. S. Magill, "The Use of the State Laboratories to the Physician."

4-4:30—Intermission, affording opportunity for discussion, the answering of questions, and further demonstrations.

4:30-5—H. B. Cleveland, "The Principles of Sanitary Investigations."

Second session, May 2, 8 p. m., held in the Municipal Laboratory.

Informal talks, Health Officer D. M. Totman and the State Commissioner of Health.

Question box, conducted by Dr. Hills Cole.

Third session, May 3, 9-12 a. m.

Field work on Skaneateles lake—A boat will convey the party to various points on the shores of the lake where the State sanitary engineers will discuss the methods employed for the protection of water supplies.

Lunch at Skaneateles.

Fourth session, May 3, 2-5 p. m.

Field work in sanitary investigation—(a), inspection of Skaneateles sewage disposal plant with a brief exposition of the construction and operation of disposal plants. (b), investigation of sanitary conditions of farms, villages, etc. Automobiles and other means of transportation were provided and the party (under the guidance of the State sanitary engineers) investigated the sanitary condition of as many farms, villages, etc., as time permitted.

The Health Bureau of the city of Syracuse demonstrated to visiting health officers the following features of its work:

Medical school inspection.

Isolation Hospital for contagious diseases.

Distributing reservoir and pumping plant.

Intercepting sewer (under construction).

Detention hospital for the insane.

Albany Society of Engineers.—At the meeting, April 25, Theodore Horton, consulting engineer, New York State Department of Health, gave an illustrated lecture on water filtration.

Engineers' Society of Western Pennsylvania.—At the monthly meeting of the society held in its headquarters in the Oliver Building, Pittsburg, April 18, Dr. Joseph W. Richards, of Leigh University, South Bethlehem, Pa., presented a paper on "The Electrometallurgical Revolution in the Iron and Steel Industry of Norway and Sweden."

Southern Gas Association.—The annual meeting was held in Montgomery, Ala., April 19-21. The program of addresses was as follows: Commercial

Lighting, by J. N. Cooke, Jacksonville, Fla.; The Inspection of Gas Consumers and Gas Appliances, by F. G. Dean, of W. N. Crane & Co.; The All-Gas Kitchen, by G. W. Howsmon, Mobile, Ala.; Advertising, by Albert B. Kelley, U. G. I. Co.; Water Heaters—Automatic, Instantaneous, Circulating, W. J. McCartney, of Humphrey Company; Application of Gas-Fired Boilers, by G. W. McKee, of the Eclipse Fuel Engineering Company; Gas Illumination, by Norman MacBeth, Welsbach Company; Relation of the New Business Department to the Gas Consumer, by George Williams, of H. L. Doherty & Co.; Street Mains and Service Construction Policy, by K. L. Simons, Birmingham, Ala.; Starting a Gas Company, by J. C. Storm, Amarillo, Tex.; High Pressure Gas Plant with Medium Pressure on Mains, by F. H. Sawyer, Newbern, N. C.; Shop Management, by A. W. Young, Knoxville, Tenn. A gas show, held under the auspices of the Montgomery Light and Water Power Company, was one of the attractions of the session.

National Electric Light Association.

—A tentative program has been announced for the annual convention at New York, May 30-June 2. There will be 16 sessions in all, with 24 papers and some 40 reports. The general calendar of meetings is as follows:

May 30, A. M., first general session; evening, Public Policy Committee, report on welfare work plan.

May 31, A. M., first technical, commercial and accounting sessions; afternoon, second general and accounting sessions. June 1, A. M., first power transmission, second commercial and third accounting sessions; afternoon, second technical and third commercial sessions. June 2, A. M., second power transmission, third technical and fourth commercial sessions; afternoon, third general session.

Among the papers and reports the following are to be noted:

General Sessions.—Reports on progress, accounting, overhead construction, insurance, question box, library, rate research, section organizations and changes in constitution; "Master and Men," by Mr. Paul Lupke; "Electrical Exhibitions," by Mr. L. A. Ferguson; "Valuation of Properties as Related to Rates," by Mr. W. F. Wells; "Reasons for Variations in Rates Under Varying Conditions of Operation," by N. T. Wilcox; "The Standardization of Electrical Selling," by Douglass Burnett; "Economies in Operation Possible Through Time Study," by Mr. L. B. Webster.

Technical Sessions.—Reports on pole preservation, underground construction, overhead construction, meters, prime movers, lamps, electrical apparatus, grounding of secondaries; "The Ventilation of Turbo-Generators," by Mr. R. B. Williamson; "Progress and Development in Self-Cooled Transformers," by Mr. H. O. Troy; "Grounding Low Tension Circuits," by Mr. P. M. Lincoln; "Recent Improvements in Single Phase Motors," by W. A. Layman; "Relation of Motor Load to Central Station Equipment," by F. D. Newbury.

Power Transmission Sessions.—Reports on governmental control of water powers and lightning protection; "Utilization of Central Stations for Supply of Electricity to Operate Railroads," by Mr. Fred Darlington; "A New Method of Reducing the Investment in Central Station Boiler Plants," by Mr. H. A. Wagner; "Determining Cost of Production in Steam Properties Under Varying Conditions," by G. H. Walbridge.

Commercial Sessions.—Reports on electricity in rural districts, power, electric vehicles, residence, business, improved standards of industrial lighting, advertising, competitive illuminants, sales departments.

Accounting Sessions.—"Tracing Store-room Material," by J. T. Brady; "The Purchasing Department," by Mr. T. W. Buxton; "Advantage of Job Cost System," by Mr. Alex. Holme; "Handling Customer's Orders," by Mr. R. F. Bon-sall; "Collection of Bills," by Mr. E. J. Bowers; "Electric Vehicle Accounts," by Mr. Herman Spoehrer; "General Office Accounting," by Mr. Franklin Heydecke; "Depreciation," by Mr. H. M. Edwards; "Use of a Tabulating Machine in Accounting Work," by Mr. Wm. Schmidt, Jr.

International Congress on Hygiene and Demography.—The fifteenth congress will be held at Washington, D. C., September 23-28, 1912. The object of the congress is to extend the knowledge and improve the practice of hygiene, public health and vital statistics in the countries which participate. Invitations to participate have been accepted by 21 countries. Occupational diseases and industrial accidents will be taken up by the section of industrial and occupational hygiene; the hygiene of houses and streets, water supply, disposal of waste and the legislative and administrative functions of boards of health will be discussed before the section of state and municipal hygiene; the section of hygiene of traffic and transportation will take up street traffic, street railway (including subways and elevated lines), railways, river and lake traffic and sea traffic, giving attention both to sanitation and to the prevention of accidents. The six other sections will deal respectively with microbiology and parasitology; dietetics and physiology; hygiene of infancy and childhood; control of infectious diseases and tropical, military and naval hygiene.

The preliminary announcement states that any person interested may become a member of the congress, entitled to participate in the proceedings and to receive a copy of its transactions upon payment of the membership fee of \$5. The address of the congress is Army Medical Museum, Washington, D. C.

Missouri Electric, Gas, Street Railway and Water Works Association.

—The fifth annual convention was held at Jefferson Hotel, St. Louis, Mo., April 13-15. Mayor Kreismann delivered the address of welcome. In connection with the reading of the minutes a discussion arose as to the advisability of admitting municipal plants to membership and a resolution was carried to the effect that they should be admitted. Among the papers read were the following: "Centrifugal Pumps," by W. H. Reeves; "Lubrication," by A. E. Flowers, University of Missouri; "Liability Insurance for Public Service Corporations," by Judge D. D. Taylor, St. Louis; "Illuminating Engineering," by J. H. McGlensey, St. Louis; "The Electric Vehicle," by Herman Spoehrer, St. Louis; "Ornamental Street Lighting," by N. J. Cunningham; "District Steam Heating," by H. C. Kimbrough; "Coal and water Gas," by P. A. Bertrand.

The following officers were elected: F. E. Murray, Louisiana, president; P. A. Bertrand, Jefferson City, first vice-president; J. G. Harsh, Joplin, second vice-president; C. L. Clary, Sikeston, third vice-president, and N. J. Cunningham, Springfield, secretary-treasurer.

Calendar of Meetings

- May 15-17.
National Conference on City Planning.—Philadelphia, Pa.—Flavel Shurtleff, Secretary, 19 Congress street, Boston, Mass.
- May 17.
Massachusetts Highway Association.—Quarterly Meeting in conjunction with the New England Conference on Street Cleaning, Springfield, Mass.
- May 17.
New England Conference on Street Cleaning.—Springfield, Mass.—Corresponding Officer, Carol Aronovici, 55 Edy street, Providence, R. I.
- May 18-19.
Ohio Society of Mechanical Steam and Electrical Engineers.—Annual Convention, Youngstown.—F. E. Sanborn, Secretary, Ohio State University, Columbus.
- May 23-25.
National Fire Protection Association.—Annual Meeting, New York City.—F. H. Wentworth, Secretary, 87 Milk St., Boston.
- May 23-26.
National Good Roads Association.—Fourth National Good Roads Congress, Birmingham, Ala.—J. A. Rountree, Secretary, Birmingham, Ala.
- May 25-26.
League of Second and Third Class Cities of New York.—Poughkeepsie, N. Y.
- May 29-June 2.
National Electric Light Association.—New York City.—T. C. Martin, Secretary, 31 West 39th St.
- June 5-14.
National Probation Officers' Association.—Boston, Mass.—Roger N. Baldwin, Secretary, 903 Security Building, St. Louis, Mo.
- June 6-10.
American Water Works Association.—Thirty-first Annual Convention, Powers Hotel, Rochester, N. Y.—John M. Diven, Secretary, 14 George street, Charleston, S. C.
- June 7-14.
National Conference of Charities and Correction.—Boston, Mass.—Alexander Johnson, Secretary, Ft. Wayne, Ind.
- June 7.
National Association for the Study and Prevention of Tuberculosis.—Denver, Col.—Dr. Livingston Farrand, Executive Secretary, 105 East Twenty-second street, New York City.
- June 11-16.
International Association of Chiefs of Police.—Eighteenth Annual Convention, Rochester, N. Y.—Major Richard Sylvester, Superintendent of Police, Washington, D. C., President.
- June 13-18.
New York State Association of Chiefs of Police.—Annual Convention, Rochester, N. Y.
- June 13-16.
American Society of Civil Engineers.—Annual Convention, Chattanooga, Tennessee.—Charles Warren Hunt, Secretary, 220 West 57th St., New York.
- June 21-22.
National Conference of Poor Law Officials.—Boston, Mass.—Dr. Robert W. Hill, President State Board of Charities, 105 East Twenty-second street, New York City.
- August 15-18.
Firemen's Association of the State of New York.—Watertown, N. Y.—A. H. Otto, Secretary.
- September 12-15.
International Association of Municipal Electricians.—Annual Convention, St. Paul, Minn.—Clarence R. George, Secretary, Houston, Tex.
- September 19-22.
International Association of Fire Engineers.—Annual Convention, Racine, Wis.
- September 19-22.
American Hospital Association.—New York City. J. N. E. Brown, M.D., Secretary, Toronto General Hospital, Can.
- September 24-30.
International Congress on Tuberculosis.—Rome, Italy.—Professor Ascoli, Secretary-General, Via Lucina, Rome, Italy.
- September 26-29.
American Society of Municipal Improvements.—Grand Rapids, Mich.—A. Prescott Folwell, Secretary, 239 West Thirty-ninth street, New York City.
- October 4-6.
League of American Municipalities.—Annual Convention, Atlanta, Ga.—John MacVicar, Secretary, Des Moines, Ia.

PERSONALS

BALDWIN, BERT, expert engineer, of Cincinnati, O., will be sent to Louisville to inspect the roller bearings and steel work for the reconstruction of Mohawk bridge.

BENNETT, WM. W., has been elected Mayor of Rockford, Ill.

BINGHAM, GEN. THEODORE A., U. S. A., retired, has been appointed Chief Engineer, in charge, in the Bureau of Highways, New York City, succeeding George W. Tillson.

BROGDEN, W. J., was elected Mayor of Durham, N. C., without opposition, at a recent election.

BURNS, CLINTON S., Consulting Engineer, of Kansas City, Mo., has completed an investigation of the water works system of South Bend, Ind.

BUSSE, CARL, was elected Mayor of Laurenceville, Ill., on the Citizens' Improvement ticket.

CARPENTER, GEORGE, City Engineer of Providence, R. I., recently delivered an interesting and instructive address on the Panama Canal.

CASSON, HERBERT N., efficiency engineer, who has lectured on and investigated municipal problems all over the country, spoke before the Chamber of Commerce of Rochester last week at a corporation meeting. The title of his address was "Industrial Efficiency as Applied to the Development of a Great City."

CHADWICK, JOHN B., has been appointed road superintendent of Great Barrington, Mass.

CHISHOLM, R. B., was elected Mayor of Halifax, N. S., for a third term by acclamation.

CHRIST, S. V., has been re-elected Mayor of Miller, S. D.

CLARK, C. N., is the new Mayor of South St. Paul, Minn.

DALTON, RUFUS I., has been elected Mayor of Winston-Salem, N. C., on the Democratic ticket.

FAWCETT, C. V., Mayor of Tacoma, Wash., has been recalled by a recent election instituted by the Welfare League, and W. W. Seymour is the new Mayor-elect, having polled 11,246 votes against 10,394 for Mr. Fawcett. Mr. Seymour will take office at the end of ten days. Mr. Seymour and Mr. Fawcett were the two leading candidates at an election only two weeks ago, when a Socialist also was in the race. Mayor-elect Seymour was the candidate of the Welfare League, and was defeated.

FRANKLIN, H. M., who has served as Mayor several times, was elected Mayor of the city of Tennillo, S. C., without opposition.

GLEASON, WALTER L., has been selected attorney for the Sewerage and Water Board of New Orleans, succeeding Omer Villere.

GOODLAND, W. S., is the new Mayor of Racine, Wis.

HANCOCK, H. D., has been appointed Fire Commissioner of Binghamton, N. Y., succeeding Wm. Barnett, resigned.

HAY, S. J., Mayor of Dallas, Tex., expects to travel in Europe this summer.

HICKEY, JOHN M., representing the American Association for Highway Improvement, delivered an address in Birmingham, N. Y. The organization which he represents has in view the affiliation of all good roads associations, and Captain Hickey has arranged to tour many of the Southern cities which have figured prominently in recent days in the movement for building public highways. Among the other cities Captain Hickey will visit are Roanoke, Va.; Bristol,

Tenn.; Knoxville, Chattanooga, Atlanta, Montgomery, Mobile, New Orleans, Vicksburg, Memphis, Little Rock, Nashville, Louisville, Frankfurt and Lexington.

LAWTON, CHARLES F., has been re-elected superintendent of public works of New Bedford, Mass.

LEWMAN, WILL C., has been elected Mayor of Danville, Ill.

McCLELLAN, WM., of New York, has been appointed Consulting Electrical Engineer of the Public Service Commission, Second District, to succeed Howard H. Crowell, of Syracuse, who resigned from the service of the commission on April 15. Mr. McClellan is a graduate of the University of Pennsylvania, and was also instructor there. He has been engaged in work with the Philadelphia Rapid Transit Company, the electrification of the New York terminal of the Pennsylvania Railroad, the electrification of the Rochester branch of the Erie Railroad, and as consulting engineer on other important work. He is a member of the Railway Committee of the American Institute of Electrical Engineers, the Electrification Committee of the New York Railroad Club, the American Institute of Electrical Engineers, and of the American Society of Mechanical Engineers.

McGraw, P. H., has been appointed Street Commissioner of Duluth, Minn.

McINTIRE, WM. W., who was appointed a member of the Sewerage Commission by Mayor Mahool, was immediately confirmed by the Second Branch of the City Council. He succeeds the late Gen. Peter Leary, Jr., as a member of the commission, Charles England having recently been elected to succeed General Leary as chairman.

MILLER, BEN F., has been elected City Civil Engineer of Meadville, Pa.

MUESER, WM., one of the best-known bridge builders and civil engineers of the United States, has been invited by the Board of Contract and Supply of Albany, N. Y., to inspect the drawings of the proposed river front improvements.

MURPHY, J. J., has been appointed Chief of Police of Butte, Mont.

O'NEIL, JOSEPH, has been reappointed City Engineer of Leavenworth, Kan.

SCHORER, ARNO R., has been appointed Director of the Parks and Playgrounds Association of New York City. Mr. Schorer was for four years connected with the Bureau of Advice and Information of the Charity Organization Society.

SITTERLE, S. S., has been re-elected Mayor pro tem. of Victoria, Tex.

THATCHER, CHARLES W., the "Apostle of Good Roads," delivered an address last week at Vincennes, Ind., under the auspices of the Board of Trade.

TODD, J. H. L., who has been Mayor of Fanwood, N. J., since 1909, has resigned because of the pressure of personal business.

WEIR, L. H., the public playground worker, who is touring the Northwest in the interest of playground improvements, recently delivered several addresses at Tacoma, Wash.

WEST, JOHN T., is the new Mayor of Pueblo, Col.

WHITE, JOHN T., has been reappointed Fire Commissioner of Saratoga Springs, N. Y.

WILGUS, WM. J., has been awarded the Telford gold medal for the paper read by him before the recent session of the Institution of Civil Engineers of Great Britain. Mr. Wilgus was formerly vice-president and chief engineer in charge of maintenance of way and construction of the New York Central, on which he installed the electric system between this city and suburban points.

TRADE NOTES

Cast Iron Pipe.—Chicago: Actual business recently closed has been comparatively small, but specifications are liberal and inquiries frequent. Prices are firm. Quotations: 6 to 12-inch, \$24.50; 16-inch and up, \$24. Birmingham: Consumers of cast-iron pipe have been inclined to delay in placing orders. Prices are well maintained. Quotations: 4 to 6-inch, \$23; 8 to 12-inch, \$22; over 12-inch, average, \$21. New York: The market is very quiet. Quotations: 6-inch, car loads, \$21 to \$22.

Lead.—Lead is quiet and barely steady. Quotations: New York, 4.425c.; St. Louis, 4.275c.

Pumping Machinery.—The International Steam Pump Company, through its foreign branch, has obtained a contract to build municipal water works at Buenos Ayres, the estimated cost of which will be \$1,000,000. The company has not decided as yet at which of its plants the pumping equipment will be made, but it is understood that the fulfilling of the contract will entail expenditures in the general market.

Contractors' Machinery.—Hetherington & Berner, Indianapolis, Ind., engineers, have under construction a new plant which will cover about four acres. The plant will be of fireproof construction. The company will enlarge its line of manufacture, and in addition to its specialty of asphalt paving plants and machinery will manufacture other kinds of contractors' machinery, including concrete mixers, road rollers, steam shovels, etc. The company will also extend its operations in steel construction work.

Cement Plant.—The Dakota Portland Cement Company, Sioux Falls, S. D., states that the construction of its plant at Chamberlain, S. D., is well under way, and that it is expected to be ready for operation about Nov. 1. It will have a daily capacity of 2,500 to 3,000 barrels. The buildings are of steel and concrete construction, and together with the terminals cover an area equal to 12 acres. The company owns its own terminals, and will operate its own locomotives.

Road Work Condemned.—The protest of the Board of Supervisors of Ontario County, N. Y., against the acceptance of the Manchester-Clifton Springs highway 607, built by the Ganz-Wilson Construction Company in 1908, under State Engineer Skeene, has been sustained by the State Highway Commission. The decision stated that the road was not in condition for acceptance. The stone used in the top course was not that called for in the contract. That the change in stone was permitted by the State Engineer's Department without the approval of the Board of Supervisors of Ontario County. The contractors were notified to complete the work in accordance with the terms of the contract.

Road Oil.—The Standard Oil Company is now delivering in different parts of the Borough of Queens, New York, 240,000 gallons of oil. It will be used on the roads in the thickly settled sections and on main traffic thoroughfares.

Auto Fire Apparatus.—The Garford Company, Elyria, O., have announced that they will manufacture motor-driven fire apparatus, patrol wagons, ambulances and other automobiles used in the public service of municipalities. R. K. Johnson, of the Garford Company, has designed a chief's car, carrying a 35-gallon chemical tank.

Street Oiling.—Street Commissioner Thompson, Elizabeth, N. J., will have the streets oiled this year at a unit contract price per square yard. Sands & Company have taken a contract to apply Texas oil for \$0.009 per square yard for the first application, and \$0.0085 for subsequent applications. The grade of oil used contains 25 per cent of asphalt.

Gasoline Fire Engine Tested.—In the presence of Battalion Chief John Howe and Captains Demarest and Henry, of the New York Fire Department, at Springfield, Mass., a test of the Knox 700-gallon capacity gasoline fire engine was made. When the gasoline engine was started one line of hose burst and the motor had to be shut down to make repairs. It was started again and ran an hour without a skip. The two lines of 2½-inch hose connected to the pump were each 150 feet long. One line was equipped with a 1¼-inch nozzle and the other had a 1¼-inch nozzle. In the capacity test the pressure at the 1¼-inch nozzle was 73 pounds and at the 1¼-inch nozzle, 66 pounds. With the 66-pound pressure, 378 gallons per minute were discharged and with the 73-pound pressure 330 gallons were thrown, making a total of 708 gallons every minute. The overflow from the radiator, which was 12 gallons per minute, added to the 708 gallons, made a total throw of 720 gallons per minute. The average altitude was 130 feet and the pump action was 310 revolutions per minute. The pressure test showed 235 pounds at the pump and 125 pounds at the 1¼-inch nozzle, throwing 425 gallons, to which was added the radiator overflow amounting to 12 gallons, making a total of 437 gallons for the pump discharge. During the hour and over that the engine was run every part of the motor gave perfect service and owing to the new system of oil cooling there was no trouble with overheating. At the test of the first gasoline pump made by the company it was noticed that the vibration was considerable and to overcome this a set of special jacks was designed for the frame. These reduced the vibration to a minimum. The first pump built had a capacity of 600 gallons a minute, but the New York department wanted more, so this pump was designed to furnish 700 gallons capacity.

High Pressure Gas System.—The Galveston Gas Company has installed a high pressure system to serve the eastern section of the city. A 4-inch wrought-iron pipe carries the gas under pressure from a booster at the works. Eight district governors or pressure-reducing devices have been installed and eight more will be put in. One governor is used to distribute the gas over an area of two or three blocks. The governors are installed in concrete stepping stones, an idea which originated with General Manager F. M. Lege, Jr., who conceived the idea of presenting residents with stepping stones costing \$35 each, and at the same time serving the valuable purpose of housing the governors.

Consulting Engineer.—James L. Tighe, Holyoke, Mass., announces that after serving the city of Holyoke for the past nineteen years as engineer of the municipal water works and city engineer, he has opened offices in the Caledonian Building, Holyoke, Mass., and hereafter will be open to engagement as consulting engineer in all problems relating to hydraulic and municipal engineering.

Consulting Engineer.—Hiram Allen Miller, Consulting Engineer, announces that, having completed the Charles River dam and basin, he has removed his office to 8 Beacon street, Boston, Mass.

Pavement Litigation.—Through the awarding of a contract for street paving to the Barber Asphalt Paving Company, Holland, Mich., will become involved in paving litigation. Contractor Harry Vanderveen, of Grand Rapids, who represents the Barber Company, submitted figures on the job for paving the thoroughfare with a mixture, upon which material the Warren Bros. claim to hold a patent and on which they claim the right to collect a royalty of 25 cents per yard. Warren Bros. warned the City Council in a telegram not to award the contract to any firm not having a license to use their mixture, as they would certainly bring suit, but the Barber Company immediately put up a certified check for \$3,000, so that in case of suit being brought it will be between the companies and the city can go ahead and complete the work. The Barber Company claims there is no difference between the mechanical mix to be used by them and that under the patent and are anxious to test the case in the courts.

Cement Rates.—The Interstate Commerce Commission has decided that general increases in freight rates on cement in trans-Missouri territory were not justified and the commission ordered the carriers to withdraw practically all of the tariffs making the increases. The carriers are directed to withdraw the tariffs by May 15 and if they do not do so the commission says that it will issue an additional order directing the maintenance of the present rates for a period of two years. If the additional order is issued the railroads will not be able to make any increases in this community until the two years have expired. The commission approved a few of the increases.

Foundations.—The Foundation Company, 115 Broadway, New York, announces that Daniel E. Moran has retired from active participation in the management of the company to engage in the practice of engineering. He will hereafter act as consulting engineer of this company, with offices at 55 Liberty street, New York City.

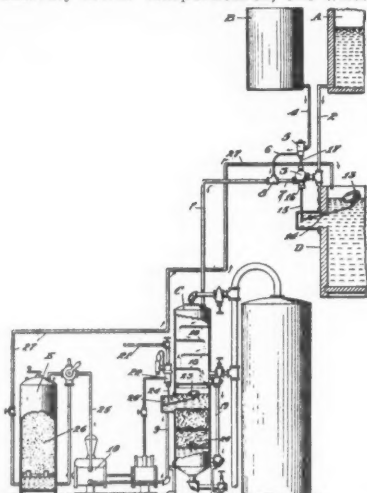
Concrete Mixers.—The Eureka Machine Company, Lansing, Mich., has published a budget of letters commending its mixer. Several years ago the Davenport Construction Company, Milwaukee, Wis., preliminary to the purchase of a mixer, wrote to a number of parties whose names were mentioned in a Eureka circular as customers, asking them about the machine. The letters published are the replies.

Crane Signal System.—Terry & Tench are testing a new crane signal system on their work at the Grand Central Station improvements. It is claimed to reduce the chances of accident to a minimum. By means of a small bulb the signal man at the boom can operate electric lights which show white for "Go slow," green for "Full speed," and red for "Stop." The lights are accompanied by whistles which designate, by the length and tone of the blast, what they are intended to indicate. In case of a short circuit putting the lights out the signal man can press a button at the end of the bulb, which rings an electric bell warning the engineer that he must rely on the whistles for working the boom instead of the lights.

PATENT CLAIMS

989,141. **PASTEURIZING APPARATUS.** Frederick Gettelman, Milwaukee, Wis. Serial No. 495,177.

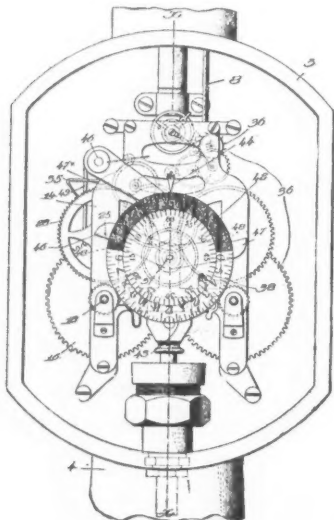
A pasteurizing apparatus comprising a housing having a series of four vats arranged therein one above the other adapted to contain water at progressively higher temperatures from the first vat to the second vat of the series, the third and fourth vats being adapted to contain water at progressively lower temperatures, the water in



the first and last vats of the series being approximately at even temperatures, guide sheaves disposed at the ends of each vat, a well at the forward end of the housing communicating with the lower vat, an endless conveyor arranged to pass over sheaves of the first vat under the rear sheave of the second vat and over the forward sheave thereof, under the forward and over the rear sheave of the third vat and under the sheaves of the fourth vat and from thence completing its circuit to the forward sheave of the first vat through the housing well.

989,654. **AUTOMATIC GAS LIGHTER AND EXTINGUISHER.** Francis W. Sherman, Everett, Mass., assignor to Independent Street Lighting Company, Boston, Mass., a Corporation of Massachusetts. Serial No. 569,449.

In an automatic gas lighter and extinguisher, the combination with a valve, of a spring for operating said valve, a cam member operated by said spring and having a recess, a pivoted locking lever adapted to enter said recess, an arm provided with a nose connected to and moving with said



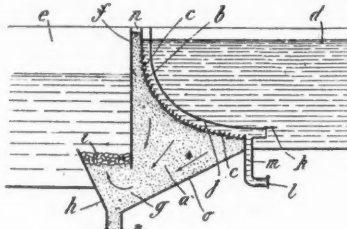
lever, a wheel provided with notches to receive said nose when the locking lever is occupying said recess, a toothed member rigid with said notched wheel, a one-toothed pinion rotated by said cam and adapted to engage said toothed member thereby to rotate the notched wheel intermittently when the cam is released, and time mechanism to release the locking lever from the recess of the cam at predetermined intervals.

989,322. **DISINFECTING COMPOSITION.** Oscar Bernheimer, Vienna, Austria-Hungary. Serial No. 457,381.

A microbicide composed of bisulfate of soda and sodium borofluoride.

989,665. **SAND FILTER AND THE LIKE.** Auguste Tixier, Billancourt, France. Serial No. 523,417.

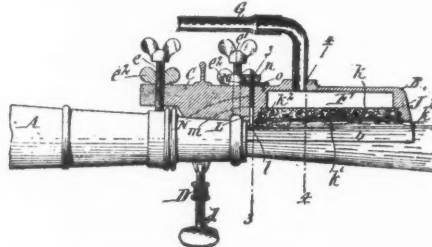
In a filter for liquids and gases, a body of granular filtering material, a wall formed by spaced blades to hold the filtering mate-



ria, a supply chamber of which said wall forms a part, means to produce a scouring current of liquid over said wall to remove the surface of the filtering material exposed between the blades.

989,880. **AIR-SUPPLYING DEVICE FOR FIREMEN.** George W. Shaw, Buffalo, N. Y. Serial No. 338,609.

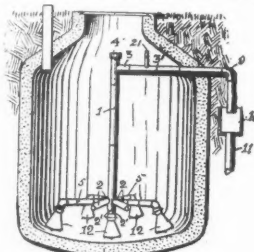
An air supplying device comprising a hood having a shank adapted to be attached to a water delivery nozzle and having an



air receiving chamber adapted to be arranged at the side of the stream issuing therefrom, a delivery conduit connected with said chamber, and a filter arranged in the path of the air.

989,827. **AUTOMATIC CISTERN-CLEANING APPARATUS.** Louis Thiem, Toledo, O. Serial No. 582,462.

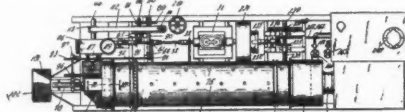
In an automatic cistern cleaner of the character described, the combination with the waste pipe of a cistern, of a main discharge pipe connected to the waste pipe and extending from the waste pipe to near the bottom of the cistern; a plurality of



extensible branch pipes radially connected to the lower portion of the main pipe, and a plurality of receivers, one for each branch pipe and the main pipe, said receivers having enlarged rim bases provided with a plurality of feet adapted to support the main pipe and its branches above the bottom of the cistern and form openings to admit water and sediment radially to the receivers.

990,782. **APPARATUS FOR PREPARING PAVING MATERIAL.** Herman J. Ruff, Indianapolis, Ind., assignor to The American Paving & Manufacturing Company of Indianapolis, Indianapolis, Ind., a Corporation of Indiana. Serial No. 479,580.

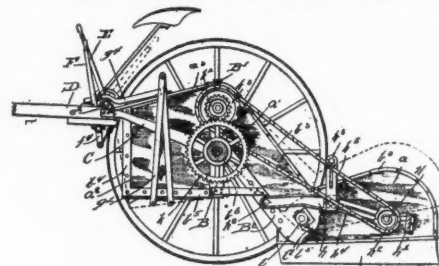
The combination, in an apparatus for preparing paving material, of a rotary drying cylinder, a stationary inclosing casing at each end of said cylinder, a furnace communicating with the inclosing casing at the delivery end of said rotary drying cyl-



inder, and a suction fan communicating with the chamber of the casing at the receiving end of said cylinder whereby the products of combustion from said furnace are drawn through said cylinder and discharged from the delivery nozzle of said fan, a receiving hopper delivering to said rotary drying cylinder, and an automatically opening and closing door arranged in the passage between the hopper and drying cylinder.

990,128. **SWEEPING MACHINE.** Pierre Haerst, Chicago, Ill. Serial No. 350,055.

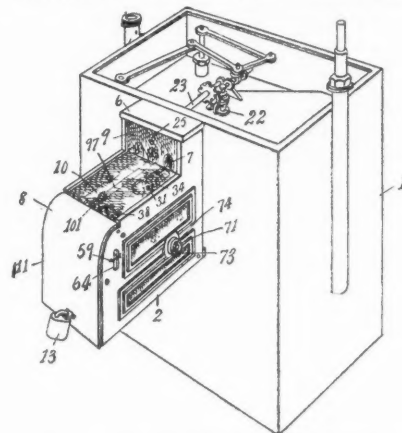
A sweeping machine, embracing a housing pivotally supported intermediate its length, a rotative brush inclosed thereby, an ele-



vator in the housing for the dirt swept up by the rotative brush, and yielding means for adjusting the housing on its pivot to vary the pressure of the rotative brush on the surface swept.

990,125. **BILL-DELIVERY MECHANISM FOR METERS.** Richard W. Gallagher, San Francisco, Cal., assignor to Automatic Billing Company, Los Angeles, Cal., a Corporation of California. Serial No. 244,634.

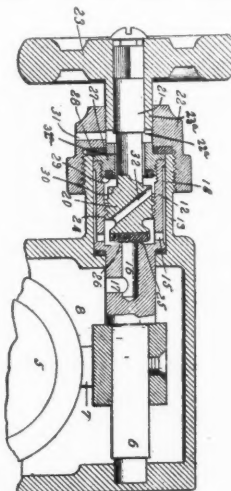
In an apparatus of the character described, the combination, with meter gear-



ing, of a recording wheel, a gear wheel for intermittently advancing said recording wheel, means for moving the recording wheel bodily to take a record therefrom, an operative connection between said gear wheel and gearing, inoperative when the wheel has been so moved and means adapted to be brought into operative connection with said gear wheel when the latter is out of operative connection with the gearing to turn said wheels to zero, substantially as described.

990,580. **PIPE-TAPPING MACHINE.** Philip Mueller and Anton C. Schuermann, Decatur, Ill., assignors to The H. Mueller Manufacturing Company, Decatur, Ill., a Corporation of Illinois. Serial No. 593,854.

In a tapping machine, a valve body, a main valve therein, said body having a by-pass formed therein and leading around



said valve, a by-pass valve of the compression type for controlling communication through said by-pass on opposite sides of the main valve, and an operating device common to both said valves.

THE WEEK'S CONTRACT NEWS

Relating to Municipal and Public Work—Street Improvements—Paving, Road Making, Cleaning and Sprinkling—Sewerage, Water Supply and Public Lighting—Fire Equipment and Supplies—Bridges and Concrete Work—Sanitation, Garbage and Waste Disposal—Police, Parks and Miscellaneous—Proposals and Awards.

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also corrections of any errors discovered.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREET IMPROVEMENTS				
Missouri	St. Louis	May 5, noon	Reconstructing various streets.	Board Public Improvements.
Indiana	Crown Point	May 5, 10 a.m.	Constructing various gravel roads in Lake County.	Chas. A. Johnson, County Auditor.
Ohio	Cincinnati	May 5, noon	Improving Carthage avenue in Columbia township.	Stanley Struble, Pres. Bd. Co. Comrs.
Indiana	Brazil	May 5, 11:30 a.m.	Constructing two gravel roads in Clay township.	Edgar A. Stagg, Audr. Clay County
Ohio	Youngstown	May 5, noon	Paving portion of Market street.	W. H. McMillin, Clk. Bd. Pub. Serv.
New Jersey	Roselle	May 5, 8 p.m.	Repairing macadam pavements, constructing new macadam pavements and bluestone sidewalks on various streets.	Jacob L. Bauer, Boro. Engr.
Florida	Tampa	May 5, noon	Paving 7,990 sq. yds. of driveways in Woodlawn Cemetery.	O. Falk, Chm. Cemetery Comn.
Minnesota	Duluth	May 5, 10 a.m.	Grading and paving portion of Juanita St.	Olof G. Olson, Pres. Bd. Pub. Wks.
Illinois	Chicago	May 6	Repairing asphalt pavements in various streets.	L. E. McGann, Comnr. Pub. Wks.
Dist. Col.	Washington	May 6, 2 p.m.	Furn. sheet asphalt for use on streets during year ending June 30, 1912.	Cuno H. Randolph, Commissioner.
Ohio	Elyria	May 8	Constructing brick pavements.	R. Moriarty, City Clerk.
Ohio	Barnesville	May 8	Paving Lincoln Street.	F. Waldo Hilles, City Clerk.
Iowa	Council Bluffs	May 8, 5 p.m.	Constr. about 3,200 lin. ft. combination curb and gutter.	Chas. J. Duff, City Clerk.
New Jersey	Atlantic City	May 8, 8 p.m.	Constructing about 15,000 sq. yds. Warren Bros. bitulithic pavement; setting curbs, gutters, headstones, etc.	E. D. Rightmire, City Engr.
California	Redondo	May 8	Paving Pacific Avenue, macadam surface.	City Clerk.
New Jersey	Jersey City	May 8, 2 p.m.	Grading, curbing, guttering and paving with Belgian block about 4,000 sq. yds.	Geo. T. Bouton, Clk. Bd. St. & Water Com'rs.
Ohio	Bowling Green	May 9	Improving 5 stone roads.	Board of Commissioners.
New York	N. Brighton, S.I.	May 9	Constr. abt. 1,210 sq. yds. vit. br. & 3,500 sq. yds. bitu. mac. pav.	Geo. Cromwell, Boro. Pres.
New Jersey	Bogota	May 9, 8 p.m.	Grading and macadamizing various streets.	Wm. N. Smith, Mayor.
Indiana	Brookville	May 9, 1 p.m.	Constructing gravel roads in Franklin County.	Chas. A. Miller, County Auditor.
Indiana	Pt. Wayne	May 9, 10 a.m.	Furn. crushed gravel for roads in Allen County.	Calvin H. Brown, County Auditor.
Ohio	Cincinnati	May 9, noon	Grading, setting limestone curbs; crossings; paving gutters with brick; paving roadway with macadam and constructing conc. retain. walls, neces. bas. & drns. in por. of Probasco av.	John J. Wenner, Clk. Bd. Pub. Ser.
Maryland	Baltimore	May 10, noon	Constr. 57.10 miles of State Hwy. in twenty counties.	John M. Tucker, Chm. S. R. Com.
North Carolina	Graham	May 10	Constructing 2½ miles of street improvement.	C. Lacy Holt, Sec'y Street Comn.
Florida	Jacksonville	May 12, 2:30 p.m.	Grading, curbing and paving with vitrified blocks of some standard brand various streets.	Philip Prioleau, City Engr.
Indiana	Rushville	May 13	Constructing gravel road 36,830 ft. long.	Joint Board Commissioners.
Ohio	Fort Meigs	May 13, 2 p.m.	Constr. tar macadam roadway and constr. concrete sidewalks.	C. W. Shoemaker, Sec'y Comrs.
Iowa	Harlan	May 15, 8 p.m.	Constructing about 7,000 lin. ft. of concrete curb and gutter; 15,000 sq. yds. concrete pavement.	O. F. Graves, City Clk.
Kentucky	Catlettsburg	May 15, 6 p.m.	Improving portions of various streets, including 14,555 lin. ft. curb and gutter and 20,305 sq. yds. paving.	H. Chatfield, City Clerk.
New York	Lackawanna	May 15, 8 p.m.	Paving with vitrified brick portion of Ridge Road.	John J. Monaghan, City Clerk.
California	Lodi	May 15	Macadamizing streets, cost of work about \$42,432.65.	City Clerk.
Iowa	Harlan	May 15	Constructing 15,000 sq. yds. concrete pavement.	O. F. Graves, City Clk.
Tennessee	Memphis	May 16	Constructing 5.1 mi. gravel paving, 3.9 mi. tar macadam, 1.4 vitrified brick, 2.9 wood block or bit. and ½ mi. old stone.	Geo. C. Love, Comr. Dept. Sts.
Ohio	Cincinnati	May 19, noon	Constr. Compton rd. in Hamilton Co.; mac. exten. of Struble rd.	Stanley Struble, Pres. Co. Comrs.
New Jersey	Camden	May 19, 8 p.m.	Constructing cement sidewalks and driveways.	Joshua C. Haines, Chm. Police Com.
Ohio	New Philadelphia	May 22	Paving the New Cumberland Road with brick.	City Clerk.
Ohio	Cincinnati	May 22, noon	Grade, cement park lot surrounding Public School.	C. W. Handman, Business Manager.
Mississippi	Hazlehurst	June 1	Constructing 58 miles of gravel roads in Copiah County.	The George Company, Ran. Bldg., Memphis, Tenn.
SEWERAGE				
Pennsylvania	Doylestown	May 5	Reconstr. the sewage disp. beds of the Doylestown Sewer Com.	Wm. Bishop, Supt.
Ohio	Cleveland	May 5	Constructing sanitary sewers in various streets.	A. B. Lea, Dir. Pub. Service.
Indiana	South Bend	May 5	Constructing a storm sewer.	A. P. Parley, Clk. Dept. Pub. Wks.
Pennsylvania	Wilkes Barre	May 5, 7:30 p.m.	Bldg. sanitary sewer in one street; and storm sewer in one street.	James Reese, Pres. Bd. of Com'rs.
Minnesota	Duluth	May 5, 10 a.m.	Constructing lateral 12-in. sewers in various streets.	Olof G. Olson, Pres. Bd. Pub. Wks.
West Virginia	Huntington	May 8, 1 p.m.	Constructing 8, 10 and 12-in. vitrified pipe sewers.	John Coon, Comr. Streets.
Kansas	Humboldt	May 8	Constructing sanitary sewers, estimated cost \$27,000.	The J. L. Worley Co. Engrs., K. C.
Ohio	Elyria	May 8, noon	Constructing a sewer system.	C. S. Buth, Engr.
Minnesota	Gilbert	May 8, 8 p.m.	Constructing 425 lin. ft. 8-in. sewers; 685 lin. ft. 10-in. sewers; 470 lin. ft. 6-in. laterals.	D. M. Mouser, Village Clerk.
Iowa	Council Bluffs	May 8, 5 p.m.	Constructing about 6,025 lin. ft. 8- and 6-in. S. G. vitrified pipe drain and special and 9 manholes.	Chas. J. Duff, City Clerk.
Wyoming	Ft. D. A. Russell	May 8	Constructing about 13,196 lin. ft. low level interceptor.	Capt. F. S. Armstrong, Q. M.
Ontario, Can.	Toronto	May 9, noon	Constr. sewers and delinquent curb con. in various stations.	G. B. Geary, Mayor.
Ohio	Lorain	May 9, noon	Constructing sewage disposal plant.	L. B. Johnston, Clk. Bd. Pub. Serv.
New York	Batavia	May 15, 10 a.m.	Construct. a section of Dist. No. 1 sewer system, cost about \$225,000.	K. B. Mathes, Chm. Bd. Sew. Com.
Oregon	The Dalles	May 15	Construct. 1,860 ft. of 8 and 12-in. pipe sewers.	L. T. Boyle, City Engineer.
South Dakota	Aberdeen	May 15, 8 p.m.	Constructing about 1,400 ft. of 8-in. sewer.	F. W. Raymond, City Auditor.
Nebraska	South Auburn	May 15, 6 p.m.	Constructing about 10,000 ft. of from 20-in. vitrified to 42-in. concrete storm sewer.	City Clerk.
Indiana	Auburn	May 15, 7:30 p.m.	Constructing sanitary sewer system on the new Greene Co. Children's Home grounds.	E. O. Little, City Clk.
Ohio	Xenia	May 15	Constr. 11,537 ft. of 10, 18, 20 and 24-in. pipe sewer and dis. plt.	Walter L. Dean, County Aud.
Wisconsin	Antigo	May 17, 2 p.m.	Constructing trunk sewers, 3,000 lin. ft. 30 and 27-in. pipe.	G. O. Palmiter, City Clerk.
Wisconsin	Baraboo	May 17	Constr. 19,750 lin. ft. 8-in. vitrified sewer; 3,350 lin. ft. 10-in. and 100 lin. ft. 15-in.; 50 manholes; 12 single flush tanks com.	A. H. Huebing, City Clerk.
New Mexico	East Las Vegas	May 17, 4 p.m.	Constructing sanitary sewer.	Chas. Tamme, City Clerk.
Ohio	E. Youngstown	May 22, noon	Construct septic tank for County hospital.	J. P. Carney, Village Clerk.
California	San Jose	July 3		City Clerk.
WATER SUPPLY				
Michigan	Saginaw	May 5, 7:30 p.m.	Furn. c. i. pipe and special cast., est. cost \$20,000.	J. P. Dear, Village Clk.
Mississippi	Bassfield	May 5, 1 p.m.	Constructing complete water works system.	Geo. W. Tompkins, City Clk.
Missouri	Monroe City	May 5	Sinking a well from 1,000 to 2,000 ft. deep.	W. E. Donner, Grant Is. Neb. Engr.
Nebraska	Chappell	May 8, noon	Constr. w. w. and an electric light plant.	John H. Taylor, Mayor.
Missouri	Chillicothe	May 8	Drilling a deep well and constr. a light and power plant.	F. H. Shaw, Supt. Water Com.
Pennsylvania	Lancaster	May 9	Constr. a concrete dam across Conestoga river.	E. R. Lieblein, Clk. Bd. Pub. Aff.
Ohio	Lakewood	May 9	Erecting an elevated steel tower on concrete base.	D. D. Clarke, Engr. Water Bd.
Oregon	Portland	May 9, 4 p.m.	Furn. 500 lengths of 12-in. c. i. pipe; 3,500 lengths of 8-in. c. i. pipe; 1,320 lengths of 6-in. and 100 tons special castings.	

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
WATER SUPPLY (Continued)				
Ohio.....	Cincinnati.....	May 9, noon.....	Laying cast iron pipe, special castings and valves; and miscellaneous work for Water Dept.....	John J. Wenner, Clk. Bd. Pub. Ser.
California.....	Anaheim.....	May 11.....	Furn. compound automobile steam engine; 150 kva, 2,200 volts, 3-phase, 60-cy. alter. current gener.; an exciter for gen.; gener. switchboard panel; building foundations.....	Edw. B. Merritt, City Clk. F. Feuchter, Clerk. C. H. Foy, City Clerk. Chas. Strauss, Pres. Bd. W. Sup.
Ohio.....	Rockport.....	May 12.....	Constructing water mains.....	D. P. McIntyre, City Clerk.
Iowa.....	Tipton.....	May 15, 7:30 p.m.....	Drilling an artesian well.....	Col. Geo. McK. Williamson, C on.Q.M
New York.....	New York.....	May 16, 11 a.m.....	Construct. portions of the city tunnel of the Catskill aqueduct.....	Board of Public Works.
Minnesota.....	Eveleth.....	May 16.....	Furn. 12,500,000 gal. capacity, high duty pumping engine of the crank and flywheel type.....	Wm. McQueen, City Clerk.
California.....	Fort Mason.....	May 17, 11 a.m.....	Constr. a 6,000,000-gal. reinforced concrete reservoir.....	
California.....	Los Angeles.....	May 26.....	Furn. fabricated steel and rivets necessary to con. abt. 1,865 ft. of 9-ft. 3-in. and 8,313 ft. of 11-ft. riveted steel syphon.....	
Brit. Col., Can.....	Vancouver.....	May 31, 4 p.m.....	Furn. steel pipe, i. pipe; also 18-in. flexible joint c. i. pipe.....	
BRIDGES				
Pennsylvania.....	Holidaysburg.....	May 5, noon.....	Repairing 5 bridges in Blair County.....	W. S. Hostler, Clk. Co. Com
Pennsylvania.....	Sunbury.....	May 5.....	Constructing four bridges.....	Board of County Commissioners.
Ontario, Can.....	Woodstock.....	May 6.....	Constructing three steel bridges and concrete abutments for same; also constructing two or three concrete bridges.....	F. J. Ure, County Engr.
Kentucky.....	Louisville.....	May 8.....	Constructing Underhill st. bridge reinforced concrete, cost about \$15,000.....	City Clerk.
Indiana.....	Shelbyville.....	May 8, 10 a.m.....	Constr. a bridge in Sugar Creek township and constructing concrete abutments and the repair of St. Paul bridge.....	G. B. Huntington, County Auditor.
Indiana.....	Washington.....	May 8.....	Constructing 7 culvert bridges.....	County Commissioners.
Pennsylvania.....	Lancaster.....	May 9.....	Constructing a concrete dam across Conestoga river at pumping station of water works.....	J. A. Leinbach, Clk. Water, Com.
Pennsylvania.....	Philadelphia.....	May 9.....	Widening Chestnut Street bridge over Schuylkill River; building bridge on Springfield Ave., value of work about \$40,000; constructing additional piling fender for the Passyunk Ave. bridge.....	
New Jersey.....	Newark.....	May 9.....	Constructing concrete arch bridge and a plate girder bridge in Bloomfield.....	Geo. Hummel, Chm. Chosen Freeholders Essex County.
Maryland.....	Baltimore.....	May 10, noon.....	Constructing one concrete bridge in Calvert County.....	John M. Tucker, Chm. S. R. Com.
Pennsylvania.....	Philadelphia.....	May 10.....	Constr. masonry wall and abutments; also bridges ready for ballast over Aramingo av., Belgrade and Thompson sts.....	Philadelphia & Reading R. R. Co.
Ohio.....	Columbus.....	May 16, noon.....	Constr. the approaches and superstructure of the Wilson Bridge over Olentangy river.....	F. M. Sayre, County Auditor.
Pennsylvania.....	Pittsburg.....	June 1.....	Widening Smithfield Street Bridge, cost about \$150,000.....	City Clerk.
New York.....	New York.....	June 1.....	Strengthening the end spans of the Williamsburg Bridge.....	Kingsley L. Martin, Comr. of Br.
Pennsylvania.....	Pittsburgh.....	July 1.....	Constructing one concrete arch, estimated cost \$85,000.....	City Clerk.
LIGHTING AND POWER				
Tennessee.....	Gallatin.....	May 5, noon.....	Furn. Corliss engine; 2 gen.; 2 switchb.; 2 elec. oper. pumps.....	E. L. Anderson, Chm. W. & L. Com.
Missouri.....	Chillicothe.....	May 8, 9 a.m.....	Constr. municipal electric light and power plant, including deep well for water supply, tower and tank, etc.....	Ira G. Graham, City Auditor.
Illinois.....	Yorkville.....	May 10, noon.....	Constr. a dam across Fox river; a power house with wheel pits, etc., complete.....	Fred W. Simpson, Secy.
Maryland.....	Baltimore.....	May 10, 11 a.m.....	Furnishing ornamental lamp posts.....	Robt. J. McCuen, Supt. of Lamps and Lighting.
California.....	Riverside.....	May 24.....	Franchise to run poles and line for conveying electric power on all roads of county.....	County Supervisors.
FIRE EQUIPMENT				
New York.....	Rensselaer.....	May 8.....	Furn. 500 ft. 2½-in. fire hose.....	Salt, City Clerk.
California.....	Oakland.....	May 17, 11 a.m.....	Furn. 3 combination chemical hose wagons; 3 third size steam fire engines; 1 motor driven pumping engine; 3 motor-driven combination chemical and hose wagons, and fire hose.....	Jas. W. Nelson, Sec'y Bd. Pub. Wks.
Oregon.....	Astoria.....	May 27, 8 p.m.....	Furn. 1,200 ft. 2½" fire hose for Fire Dept.; 200 ft. for Street Dept.....	C. E. Foster, Chief Fire Dept.
New Jersey.....	Princeton.....	July 5.....	Furn. auto pumping engine.....	E. M. Updike, Chm. F. & W. Com.
MISCELLANEOUS				
Pennsylvania.....	Erie.....	May 8, 8 p.m.....	Constructing an incinerator plant complete.....	B. E. Briggs, City Engr.
West Virginia.....	Wheeling.....	May 8.....	Wrecking the easterly resort house and rebuilding.....	City Engr.
Ohio.....	Cincinnati.....	May 10, noon.....	Constructing hospital buildings.....	Hannaford & Sons, Arch.
Connecticut.....	Plymouth.....	May 10, noon.....	Alterations and additions to Town Hall at Terryville.....	J. D. Waldron, Selectman.
Wisconsin.....	Superior.....	May 11, 1 p.m.....	Improving of Quebec Pier by constructing a revetment along the sides of driveway.....	P. J. Ekstrand, Pres. Bd. Public Wks.
New York.....	Albany.....	May 15, 3 p.m.....	Installing police signal system.....	Isidore Wachsmann, Sec'y Bd. Cont and Supply.
New Jersey.....	Passaic.....	May 19, 8 p.m.....	Install Police Signal, Fire Alarm and Mun. Tele. Exchange.....	M. B. Matthews, Chm. Com. Pub. S.
Ohio.....	Mount Gilead.....	May 19, 11 a.m.....	Furn. iron culvert pipe from 8 to 48-in. diameter.....	Clinton Sipe, County Auditor.

STREET IMPROVEMENTS

Selma, Ala.—Paving of portion of Broad st. is being considered.

Tuscaloosa, Ala.—Council has ordered City Engineer to ask for bids for proposed street paving.

Fullerton, Cal.—Council is considering election on \$178,000 bonds for improvement of streets.

Napa, Cal.—Council has decided to macadamize and curb portions of Polk, Seymour, North Seminary, Clary and West 3d sts.; work will be done by George Errington and will cost about \$9,000.

Riverside, Cal.—City will grade, macadam and oil Mulberry st.; also construct cement curb and concrete gutter.—W. V. Darling, Superintendent of Streets.

Santa Monica, Cal.—Paving of Ocean ave. is being considered by Council.

Pueblo, Col.—Work will at once begin on extension of Grand ave.

Hartford, Conn.—Board of Finance is considering \$4,739 appropriation for macadamizing Whitney st. and \$2,000 for Capitol ave.

Washington, D. C.—District Commissioners have asked Congress for authority to build municipal asphalt plant.

Brooksville, Fla.—Citizens have voted \$18,000 bonds for street improvements.

Palatka, Fla.—Council is considering election on \$12,500 bonds for additional vit. brick paving.

Perry, Ga.—Houston County Commissioners of Roads and Revenues are considering \$100,000 bond issue for improving roads and bridges.

Evansville, Ind.—Board of Public Works is considering improvement of McCormick ave. with asphalt.

Fort Wayne, Ind.—Board of Public Works has ordered plans prepared for paving 15 additional streets.

Indianapolis, Ind.—The Board of Public Works has confirmed resolution for improving Locke st., Walnut st. to Indiana ave.; estimate of cost prepared by City Engineer Klausmann is \$10,100.

New Orleans, La.—State Board of Engineers has rejected bids received for proposed highway from Colfax to Rochelle via Droug, Selma and Georgetown, Grant Parish; bids were received for two kinds of road, labeled No. 1 and No. 2; for No. 1 it was stipulated that the timbers should be creosoted, concrete culverts, vit. pipe for sewers and other high-class materials; No. 2 road did not call for treated timber and instead of concrete culverts and vit. piping, it was stipulated that corrugated iron would be acceptable; road No. 1, J. W. Thompson, Jackson, Miss., \$107,290; A. L. Patterson & Co., New Orleans, \$98,768.20;

road No. 2, J. W. Thompson, \$82,936.60; A. L. Patterson & Co., \$76,445.76.

Rockville, Md.—Montgomery County Commissioners are planning to improve road from Rockville to Norbeck; distance of four and a half miles; work will be under supervision of M. Donaldson Knight, County Road Superintendent.

Gloucester, Mass.—Board of Aldermen has adopted order appropriating \$2,500 for improvement of East Main st.

Lowell, Mass.—Committee on Streets has voted to recommend loan of \$75,000 for paving.

Southbridge, Mass.—Contract will soon be let for paving Hamilton St.; \$23,000 is available.

Detroit, Mich.—Commissioner of Public Works J. J. Haarer will soon ask bids for paving several streets and alleys, estimated at \$14,000.

Lexington, Mo.—Citizens have voted \$125,000 bonds for road improvements.

Reno, Nev.—Commissioners of Washoe County are considering matter of building a road from Reno along banks of Truckee River to Nevada State line.

Merchantville, N. J.—Citizens are considering improvement of streets.

Paterson, N. J.—Board of Freeholders will expend about \$55,000 on roads.

Perth Amboy, N. J.—County will again macadamize State st. from the point where

pavement stops in the northern section of city to Woodbridge creek; distance about a mile; Amboy ave. will receive similar treatment from New Brunswick ave. at Lehigh Valley tracks to Woodbridge, distance of about five miles.

Rahway, N. J.—Bids will soon be asked for paving Main st.

Trenton, N. J.—County Engineer Eppel has estimated cost of properly repairing and resurfacing county roads at \$180,000.

Rochester, N. Y.—Board of Aldermen is considering following improvements: Ave. D asphalt pavement, estimated cost \$28,000; Dewey ave. asphalt pavement, \$22,000; Lake View Terrace asphalt pavement, \$6,000; Raines Park asphalt and brick pavement and sewer, \$26,000; Park ave. asphalt pavement, \$16,000; Roosevelt st. asphalt pavement, \$3,900; Pinnacle road asphalt pavement \$10,000; Conkey ave. brick pavement, \$25,000; Weaver st. brick pavement, \$8,000; Seward st. asphalt pavement, \$34,000; Post and Bingham sts. asphalt pavement, \$12,000; Ashland st. asphalt pavement, \$8,000; Alpine st. macadam pavement, \$1,500; Goldsmith place asphalt pavement, \$3,000.

Utica, N. Y.—Mayor Gillmore has recommended resurfacing of asphalt streets.

Cincinnati, O.—Supervisor of Roads Mills has prepared plans for proposed road from Independence to Ryland; cost \$2,400.

Girard, O.—Council has decided to ask for bids for building sidewalk and cross walks.

Maple Grove, O.—Township will vote May 22 on \$10,000 bonds for construction of five miles of stone roads.—W. Yaklin, Township Clerk.

Pittsburg, Pa.—Department of Public Works will soon ask bids for improvement of Eighteenth st. road.

Columbia, S. C.—Council is considering paving of Sumter st. with bitulithic and Hampton and Washington sts. with wooden blocks.

Sumter, S. C.—City will expend \$25,000 for improvements on its main street.—W. Loring Lee, Engineer.

Chattanooga, Tenn.—Main st. will be paved with 14-ft. center of brick, flanked on each side by 11-ft. strip of bitulithic or some similar substance; Main st., in St. Elmo, will be paved with brick to point near the cemetery gate, and from that point, Georgia ave., St. Elmo, will be paved with bitulithic or some similar substance to end of street car line.

McMinnville, Tenn.—Warren County will vote May 6 on \$100,000 additional bonds to extend pikes.

Waverly, Tenn.—Citizens have defeated proposition to issue \$100,000 bonds to build roads.

Brady, Tex.—District No. 1, McCullough County, will at once engage engineer to make surveys and estimates for macadamizing roads; \$75,000 bonds voted; district is 10 miles wide and 20 miles long; bids will soon be asked; Committee, Lee Jones, Chairman, will have direct charge of work under County Commissioners. A. M. Martin can be addressed.

allas, Tex.—City Commissioners have decided to place two concrete culverts on Haskell and San Jacinto and on Haskell near Ross; cost \$3,085.

Dayton, Tex.—Dayton precinct of Liberty County will vote May 23 on \$275,000 of bonds for construction of shell road.

Longview, Tex.—Citizens have voted \$90,000 bonds for paving business streets, electric lighting, etc.—G. A. Bodenheimer, Mayor.

Paris, Tex.—Precinct No. 1 has voted \$300,000 bonds for construction of good roads.

San Angelo, Tex.—City is planning immediate paving of from 16 to 20 blocks in business section; about \$100,000 will be spent.

Alexandria, Va.—Council has passed resolutions for proposed improvements: \$4,000 for vit. brick on Duke, Royal to Fairfax; \$7,500 for narrowing Alfred st., Prince to Wilkes, and providing roadway with macadam and also sidewalks; \$4,000 for roadway and paving with vit. brick Alfred, King to Prince; \$3,650 for improving South Royal st. with vit. brick, and laying sidewalks; \$4,000 for vit. brick street and sidewalks on Fairfax between Duke and Wolfe; \$11,200 for vit. brick on Washington st., King to Duke st.; \$11,200 for vit. brick on Washington st., from King to Queen; \$3,150 for curbing and guttering on Payne, from Cameron to Oronoco; \$4,200 for guttering and sidewalks on West, King to Oronoco, \$2,400 for macadam roadway on Alfred, Queen to Princess; \$4,000 for vit. brick on Pitt, King to Cameron st.; \$4,000 for vit. brick on St. Asaph, King to Cameron; \$4,700 for macadam on Cameron, Royal to Pitt; \$5,000 for macadam on Cameron, Pitt to Washington.

Belair, Va.—Alexandria County will expend about \$30,000 on road improvements.

Wise, Va.—Wise County Board of Supervisors will open bids about May 25, for construction of about 125 miles of macadam roads.

Spokane, Wash.—City Commissioners have called for improvements for which following bonds must be issued this year: Paving, \$928,668; grading, \$796,765; sidewalks, \$16,014; sewers, \$612,657.

Tacoma, Wash.—Council has passed ordinances for improvement of Columbia ave., East B, North 16th and other streets.

Beloit, Wis.—Council has decided to improve portions of seven streets.—J. L. Hendley, Chmn. Board Public Service.

Janesville, Wis.—Mayor John C. Nichols has recommended improvement of streets.

Burnaby, B. C., Can.—Citizens have voted \$850,000 bonds for road improvements and extensions to water works.

CONTRACTS AWARDED

Aliceville, Ala.—To J. M. Swaim, Chapel Hill, Tenn., to construct concrete sidewalks; walks to be 5½ ft. wide, including curb.

New Decatur, Ala.—To Halliburton & Brooks, Birmingham, to construct cement sidewalks in East New Decatur, \$8,319.38.—Henry Hartung, City Clerk.

Los Angeles, Cal.—To Paonissa & Taylor, Shory Bldg., Los Angeles, for grading streets, constructing curbs and gutters, at the new townsite Planada, about \$80,000.

Los Angeles, Cal.—Paving 16th st. with asphalt, Figueroa st. to Pacific ave., to Barber Asphalt Paving Co., \$53,473.60; Figueroa to Main st., to B. F. Ford, \$11,149.58; paving portions of Flower and other streets on hill, to Barber Asphalt Co., \$34,377.04.

Vincennes, Ind.—By Board of Public Works for improvement of Culop st., 6th st. to the B. & O., to Foulkes Construction Co., Terre Haute; improvement of 13th st. from Hickman to the east limits of city, to P. W. Lenahan.

Wabash, Ind.—Grading, paving and curbing Manchester ave., to Western Construction Co., \$33,800.

Des Moines, Ia.—Paving W. 38th st. and other streets, to Bryant-McLaughlin Co., Waterloo, \$1.73 per sq. yd.

Bunkie, La.—Constructing road and canal from Bunkie to Bayou Dulac, to S. J. Burdlin, Cottonport, \$22,700.

Boston, Mass.—To Connolly & Diamond for tar macadam roadway, trap rock, in Granville st., \$5,518.16; other bidders: John Kelly & Co., \$5,806; J. H. Ferguson, \$6,408.90; Fred S. & A. D. Gore Corporation, \$5,794.30; John McCourt & Co., \$5,819.95; Wm. J. Rafferty & Co., \$5,663.30; R. J. Young & Co., \$7,288.50; James Doherty, \$5,978.20; Daniel E. Lynch, \$7,348.20; Timothy F. Bradley, \$5,818.40; D. M. Biggs & Co., \$5,919.80; John F. O'Connell, \$5,778.85; Engineer's estimate, \$7,500; to William Roferty & Co. for tar macadam roadway, trap rock, in Emmet st., \$890.15; other bidders: J. H. Ferguson, \$1,134.60; John McCourt & Co., \$1,016.10; Engineer's estimate, \$1,400; to the West Roxbury Trap Rock Co. for tar macadam roadway of local stone in Danville st., \$3,275.60; other bidders: William J. Rafferty & Co., \$3,373.90; Engineer's estimate, \$4,000; to John Kelly & Co. for tar macadam roadway of trap rock in Almsworth st., \$6,598.63; other bidders: West Roxbury Trap Rock Co., \$7,499.10; William J. Rafferty & Co., \$7,989.60; Engineer's estimate, \$8,600; to J. C. Coleman & Sons Co. for macadam roadway of local stone in Greenwood st., \$13,261; other bidders: Connolly & Diamond, \$13,501.10; James Doherty, \$13,859.15; William J. Rafferty Co., \$14,115.80; John F. O'Connell, \$14,368.90; D. M. Biggs & Co., \$15,509.50; John McCourt & Co., \$13,756.05; John Kelly & Co., \$13,651; Daniel E. Lynch, \$16,788.30; Engineer's estimate \$16,700; to Lowe Armstrong Co. for repaving tar sidewalks in various sections of city, 69c. per sq. yd. for three-layer work, 49c. for two-layer work, and 34c. for wearing surface; to C. D. Dolloff & Co. for repaving artificial stone sidewalks, 35c. per sq. ft. for less than 20 sq. ft., each job, 25c. for 20 and less than 100 sq. ft., 17c. for 100 and less than 300 sq. ft., 15c. for 300 and less than 500 sq. ft., 12c. for 500 and less than 700 sq. ft., 12c. for 700 and less than 900 sq. ft., 12c. for 900 sq. ft. and over.

Fall River, Mass.—Laying pavements, to Alexander Burrows, 24c. per sq. yd.

Granby, Mass.—To Charles E. Horn, Milbury, for putting in mile and a half of State road.

Holyoke, Mass.—Furnishing Portland cement, to C. J. Burnham, \$1.64 per bbl., four sacks to the barrel; there will be 10 cents rebate for the return each sack, the expense of shipment to be borne by the Water Department; Saylor's cement will be furnished; other bidders: Samuel Snell, \$1.65 for Nazareth cement and \$1.70 for Vulcanite; Prew & Co., \$1.70; W. R. Ross & Co., \$1.70 for Dexter; C. B. Sampson, \$1.70 for Atlas or Ironclad; Prentiss, Brooks & Co., Lehigh or Dragon.

Lynn, Mass.—Upon recommendation of Street Commissioner McPhetres Council has decided to instruct the Purchasing Agent to reject all of the bids recently submitted on finished curbs and to award contract to John L. Goss, Stonington, Me., for a large load of curbstones in the rough to be delivered at city landing at rate of approximately 25c. per ft.

Holland, Mich.—Paving Central ave., from 8th to 18th st., to Harry Van Der Veen, Grand Rapids, Mich.; Bermuda asphalt upon concrete base, \$17.613.

Duluth, Minn.—To D. H. Clough for paving 3d alley between 20th and 21st aves. and 21st and 22d aves., \$1,280.90 and \$709.65; to Harry B. Raymond for furnishing plank for sidewalks for coming year; for the district east of 12th ave. West, \$5,569.50 and for that west of that avenue, \$3,904.50.

Webb City, Mo.—Asphalted macadam pavement, to Webb City Paving Co., Webb City, 8,266 sq. yds., 83c.; 4,713 lin. ft. curb and gutter, to M. Gillioz, Pierce City, 60c. per lin. ft.—A. J. McKenzie, City Engineer.

Elizabeth, N. J.—Repairing county road running through village of Chatham, to C. H. Winans Co., 12,678 sq. yds. of 3-in. amiesite, \$10,649.52; 12,678 sq. yds. of 4-in. amiesite, \$13,053.34; 400 tons of crushed stone, \$680, and 200 lin. ft. under drain, \$60.

Newark, N. J.—Tentative awards for street paving have been made to following low bidders: Bigelow st., Elizabeth to Frelinghuysen ave., brick, McMahon Construction Company, \$7,961.20; South Fourteenth st., Springfield to South Orange ave., brick, Van Keuren & Son, \$89,930; Ogden st., repaving, Clay to Bridge sts., oblong granite block, \$78,346.50; Vincent st., Ferry to the Waverley and Passaic Railroad, brick, \$9,672, both to the New Jersey Paving Corporation; South Seventeenth st., Springfield to South Orange ave., brick, \$40,717.60; Fourteenth ave., South Eleventh st. to city line, brick, \$23,224.50, both to Newark Paving Company; Malvern st., Pacific st. to Wheeler Point Lane, \$47,247.90; Delancey st., between same points, \$42,041.80, and Tyler st., Walnut to South sts., \$37,176.60, all with granite block, and to the Shanley Company; Sherman ave., Pointer to Peddle sts., \$31,938; Mapes ave., Elizabeth ave. to Bergen st., \$13,500; Clifton ave., Grafton ave. to Verona ave., \$15,039, and Madison ave., from Chadwick ave. to South Eleventh st., \$30,813, all with bitulithic, and to Standard Bitulithic Company.

Ventnor, N. J.—Paving, to G. Mulock Co., asphalt macadam, \$1.33½ per sq. yd.; total about \$85,674.70.

Albany, N. Y.—Improving West Lawrence st., to John M. Holler, \$8,882.80.

Albany, N. Y.—Construction of good roads: Highway No. 5103 and Highway No. 5104, Stuyvesant Falls and Valatia, respectively, to J. O. Houriga, Albany, \$118,440; Highway No. 881, Cortland County, to Joseph McCormick, East Providence, R. I., \$22,780; Highway No. 5092, Dutchess County, to Suffolk Construction Co., Huntington, \$40,990; Road No. 5095, Dutchess County, to W. K. Cowbig, Poughkeepsie, \$12,280; Road No. 913, Erie County, to Louis H. Cipp, Buffalo, \$38,990; Road No. 5096, Fulton and Montgomery counties, to the Hollington Co., Troy, \$39,370; Highway No. 465, Herkimer County, to Brown & Lowe, Schenectady, \$52,147; Highway No. 716, Livingston County, to Carlton-Reynell, Long Island City, \$17,950; Highway No. 883, Madison County, to Joseph McCormick, East Providence, R. I., \$23,973; Highway No. 5109, Montgomery County, to John E. Consalus, Albany, \$51,420; Road No. 898, Nassau County, to H. J. Mullen, Jamaica, \$38,800; Road No. 896, Onondaga County, to W. J. Burns Co., Syracuse, \$27,117.05; Road No. 415, Orange County, Harper, to Jova & Kehoe, Inc., Newburg, \$31,900; Road No. 909, Putnam County, to Harvey B. Sproul, Peekskill, \$45,800; Road No. 5098, Putnam County, to Samuel Beskin, Peekskill, \$15,900; Road No. 5107, Rensselaer County, 40 miles, to Wiltsey & Rigney, Rensselaer, \$7,468.06; Road No. 903, Steuben County, to Fred E. Ellis, Melrose, Mass., \$19,901.55; Post Road No. 310, Ulster County, to Lane Construction Co., Meriden, Conn., \$34,380; Road No. 918, Wayne County, to Bellwe & Merritt, Tuckahoe, \$8,990; Road No. 899, Westchester County, to Frank C. Fowler, Mt. Kisco, \$464,513; Road No. 892, Wyoming County, to Frederick J. Munn, Buffalo, \$15,800; Road No. 923, Genesee County, to Miller & Knickenberg, Buffalo, \$15,944.07; Road No. 923, Genesee County, to Miller & Knickenberg, \$42,500.

Albany, N. Y.—By State Highway Commission for Highway No. 921, Rifton Village, to Joseph Walker, New Paltz, \$28,706, on Bermudez; other bidders: James E. Martin, Poughkeepsie, \$32,900; L. F. Bannan, \$31,092; S. B. Van Wageningen, \$31,258; DeGraff & Hogeboom, \$36,000; Lane Construction Co., \$32,200; Ballock & Andel, \$31,893; Kennedy Construction Co., \$37,375; Samuel Beskin, \$30,383; Thomas H. Karr,

\$31,700; to same, for .64 mile of highway in Fort Plain Village, Montgomery County, \$7,204; Tuxedo road, in Orange County, to Sprout & Elsin, Peekskill, \$86,230; the W. J. Burns Co., Syracuse, for improvement of the Skaneateles-Camillus road, 4.24 miles, \$48,389.80; J. H. Weidman, also of Syracuse, \$50,000; P. H. Murray, Rochester, \$49,370; Eastwood-East Syracuse village road, to W. J. Burns Co., \$27,171.05; Champlain to Mooers Forks, Clinton County, 6.52 miles, to the Spellman-Oliver Co., Chateaugay, \$63,800; Fishkill Village, Dutchess County, .89 of a mile, to Hallock & Angle, Newburg, \$15,598; Johnstown to Broadalbin, to S. B. Van Wagenen, Rondout, \$58,000; Little Falls City, Herkimer County, 1.45 miles, to James E. Martin, Poughkeepsie, \$22,994; Wyatts to Hoffman, Schenectady County, 5.31 miles, to Joseph Walker, New Paltz, \$42,304; Milton to Marlboro, Ulster County, 3.82 miles, to Samuel Beskin, Fishkill, \$39,400; Cambridge to Salem, Washington County, 3.68 miles, to W. A. Burnham & Co., Glens Falls, \$34,000; Luzerne to Lake George, Warren County, 3.67 miles, to S. B. Van Wagenen, Rondout, \$36,779; Woods Bridge-Lewis Corners County highway, in Westchester County, 4.26 miles in length, to Samuel Beskin, Fishkill, on residuum, \$44,825, subject to right of way; Highway No. 5108, Brainard Station, Rensselaer County, .35 mile, to Krow & Walsh, Pittsfield, Mass., \$4,650, on Bermudez; other bidder: Kennedy Construction Co., Albany, \$5,473; County Highway No. 709, Millerton-Columbia County line, Dutchess County, 4.70 miles, to Lane Construction Co., Meriden, Conn., \$41,390; other bidders: Samuel Beskin, Fishkill, \$42,500; James E. Martin, Poughkeepsie, \$45,498; Thomas H. Karr, Troy, \$43,750; E. W. Peck, Stratford, Conn., \$45,950; Joseph Walker, New Paltz, \$42,883.

Laurelton, L. I., N. Y.—Laying about 50,000 yds. of street resurfacing, to M. C. Madsen.

New York, N. Y.—Repairs to asphalt pavement on bridges over Harlem River during 1911, to Barber Asphalt Paving Co., 30 Church st., \$6,930.—Kingsley L. Martin, Commissioner of Bridges.

Oneida, N. Y.—By Board of Public Works for construction of William st. pavement, to Meyer & Ballard, city, crowning brick, \$16,259.50.

Rochester, N. Y.—Hopkins st. brick pavement, to Clarence Aikenhead Co., \$1,497.50; granite steps at Cobb's Hill reservoir, to F. C. Lauer & Sons Co., \$1,667; cement walks on Lyell ave., to William Baker, \$236.55.

Schenectady, N. Y.—Grading Vischer ave., to Union Paving Co.; paving Hattie st. with asphalt and brick, to Schenectady Contracting Co.

Beach City, O.—Paving Main and West sts. with vit. block on gravel foundation, to T. J. Norman & Son, Coshocton, \$12,195.

Columbus, O.—Street improvements: Barthman ave., High st. to Parsons ave., to William M. Graham, \$21,684 for brick; Beech st., Forest to Schiller st., to S. T. Knight, \$9,325; brick: Columbus st., Parsons ave. to Front st., to S. T. Knight, \$25,603, for brick; Pendleton ave. Raynard st. to Livingston ave., to John C. Beasley, \$6,903.50, for brick; Reeb ave., High to 7th st., to William M. Graham, \$12,404, for brick; Stone ave., Nicholas to 18th st., to John C. Beasley, \$7,788, for brick; Town st., Hawkes to Central ave., to D. E. Sullivan & Sons, \$14,932, for brick.

Pawhuska, Okla.—Paving to cost \$90,000, to Shelby-Downard Co., Ardmore; Ardmore rock asphalt will be used.

Erie, Pa.—Laying asphalt pavements in E. 14th and W. 26th sts., to J. & M. Doyle; E. 14th st., 95c. for Class B and 90c. for Class C, 50c. for base, artificial curb, 30c. per ft. for 9-in. and 80c. for 6-in. pipe; pavement on W. 26th st. from Cascade to Cranberry st., Class B asphalt bid, 95c. with 40c. for base, and 30c. for curbing; catchbasins, \$30; flush spills at \$5; 9-in. pipe 50c., and 6-in. pipe, 40c.

Harrisburg, Pa.—To William L. Martin, to build the road in Wildwood Park from the breast of the dam to the Linglestown road, \$3,795; other bidders were Stucker Bros. Construction Co., \$4,300; United Ice and Coal Co., \$4,250.

Harrisburg, Pa.—Opening and grading Nectarnel, Hunter and Summit sts., to United Ice and Coal Co., about \$1,000.

York, Pa.—Improving six miles of State highway in Springfield Township, to Reilly, Fritz & Co., Lancaster, \$40,921.

Greeneville, Tex.—Paving, to General Paving Co., Hot Springs, Ark., 10,000 sq. yds. brick pavement, \$2.24 per sq. yd.; 4,000 sq. yds. asphalt concrete pavement, \$1.85 per sq. yd.; Texas Bitulithic Co., 91,000 sq. yds. bitulithic pavement, \$2.29 per sq. yd.; to Creosoted Wood Block Paving Co., 33,000 sq. yds. wood block pavement, \$2.53 per sq. yd.; to R. C. Stubbs, 4,000 sq. yds. vitrolithic concrete pavement, \$1.75 per sq. yd.

Logan, Utah.—Paving District No. 19, to Madsen-Whittier Construction Co., Boise, Idaho, \$19,386.01; other bidders: J. E. Wilson, Jr., \$20,218.27; L. S. Hill, \$20,082.42; N. S. Andrew, \$20,638.86; Brown & Doremus, \$23,429.70.

Salt Lake City, Utah.—To P. J. Moran, for street paving extension No. 64, in Sixth South st., State st. to First West st., \$2,032.04.

Everett, Wash.—Improving Wall st., to F. K. Ffolhette, \$10,415; other bidders: Atlas Construction Co., \$11,970; Snyder & Co., \$11,279; N. T. Ellenson, \$11,777.

Hillyard, Wash.—To Contractor A. Woodward for grading and improving Logan st. and the west end of Everett st.

North Yakima, Wash.—To Root & Biegle, Spokane, to building concrete walks in McKinley ave. district of Modern addition, \$23,431.75; to Kiebler & Erickson, Tacoma, for cement walks in the Garfield district of Modern addition, \$22,589.65, and for grading this district, to D. T. Daniels, city, \$13,060; total length of the new walks will be 11 miles.

Paso, Wash.—Paving with bitulithic, to C. A. Squires, Walla Walla; paving, with a concrete base, will be \$2.41 sq. yd., or a total cost of \$44,630.44; bid was on paving for Lewis and 4th sts., the estimated amount of work to be completed being 17,174 sq. yds.; City Engineer's estimate, \$44,075.47.

Seattle, Wash.—Grading and curbing 8th ave. S., to Agassee & Hadley, 1212 Western ave., \$9,406.50; paving 8th ave. S. and Duwamish ave. with vitr. brick, 6-in. curb, to T. Ryan, 214 Sullivan Bldg., \$52,051.28; grading 20th ave. N. E., to L. H. Goerig, 836 Shelby st., \$15,749; resurfacing 15th ave. N. W., to Great Western Fuel Co., 2523 4th ave., \$9,283.90; concrete walks on N. and W. 74th st., to Geo. Hanson, 5312 6th ave. N. W., \$17,898.85.

Clarksburg, W. Va.—By Harrison County Commissioners, to W. T. Gates & Co., Flemington, to pave West Milford pike, \$8,230.

Saskatoon, Sask., Can.—Cement sidewalks aggregating about 500,000 sq. ft. exclusive of curbing and amounting to over 12 miles, to Western Pavers, Ltd., Winnipeg; price slightly over \$90,000; work is in charge of Charles Curtis, Winnipeg.

BIDS RECEIVED

Stockton, Cal.—By Supervisors for construction of 2,713 ft. of asphaltum pavement on California st. and for 3,437 ft. of same pavement on Cherokee Lane: Ransome Cumney Co., California st., \$11,998; Cherokee lane, \$16,726.46; City Street Improvement Co., California st., \$11,860; Cherokee lane, \$16,726.46.

Muncie, Ind.—Paving streets with brick: Jackson st., Mulberry st. to Ohio ave., Gubbins & Co., \$15,305.40; Birch, \$15,394.70; Moore, \$15,417.68; Simmons, \$15,713.48; Torrence, \$15,732.48; Guinnup, \$15,858.66; Worley, \$16,107.99; G. Freshwater & Sons, \$16,121.09; Daniels & Lyst, \$16,389.79; Harding & Co., \$16,529.60; Jefferson st., Adams to Charles, Birch, \$939.22; Gubbins & Co., \$944.77; Torrence, \$959.78; Worley, \$978.12; Moore, \$1,000.35; Guinnup, \$1,005.90; Simmons, \$1,011.46; Daniels & Lyst, \$1,017.02; Howard st., High to Council, Birch, \$7,158.08; Moore, \$7,159.69; Gubbins & Co., \$7,213.06; Daniels & Lyst, \$7,499.67; Simmons, \$7,501.87; Freshwater & Sons, \$7,505.62; Harding & Co., \$8,170.50; Liberty st., Seymour to Washington st., Birch, \$8,255.82; Moore, \$8,277.41; Gubbins & Co., \$8,521.20; Simmons, \$8,569.04; Worley, \$8,676.73; Guinnup, \$8,694.99; Harding & Co., \$8,857.34; Freshwater & Sons, \$8,858.64; Brineman, \$8,863.86; Daniels & Lyst, \$8,903.50; Torrence, \$9,096.19.

Mt. Sterling, Ky.—Building brick streets, H. J. Shoupe & Co., Dayton, O., only bidder; streets laid in concrete base and with very best brick, \$1.78 per sq. yd. complete; bid was made on basis of 11,000 sq. yds. of brick in first contract, work to be begun by May 1, and streets completed by Oct. 1.

Lynn, Mass.—Furnishing stone in the rough to be delivered to the city, lowest bidder, John L. Goss, Stonington, 25 1-5c. per lin. ft.; other bidders: H. E. Fletcher Co., Westford, 29 2-5c.; C. E. Mudge, Lynn, 35c.; Hildreth Granite Co., 37c.; Thomas Rafferty, 40c.; Ryan-Parker Construction Co., 55c.

St. Louis, Mo.—Municipal asphalt plant, which will enable the city to attend to the maintenance of its asphalt streets, on which contractor's maintenance contract has expired, Warren Bros. Co., Boston, \$19,800; bid is below the appropriation of \$20,000; second bidder, Heatherington & Berner, Indianapolis, \$22,162; third bid, made by the Equitable Asphalt Co., of Kansas City, \$16,700, was rejected because no specifications accompanied bid.

Columbus, O.—Paving various streets, low bidders were as follows: Beech st., Forest to Schiller st., S. T. Knight,

Portsmouth and Trimble block, \$9,325; Barmham ave., High st. to Parsons ave., Wm. M. Graham, Trimble block, \$21,408; Stone ave., Nicholas to 18th st., J. C. Beasley, Trimble, Portsmouth, Nelson block, \$7,788; Reeb ave., High to 7th st., Wm. M. Graham, Trimble block, \$12,235; Town st., Hawkes to Central ave., D. E. Sullivan & Son, Nelson, Trimble block, \$14,932; Pendleton ave., Raymond st. to Livingston ave., J. C. Beasley, Nelson, Portsmouth, Trimble block, \$6,903; Summit st., 11th ave. to Hudson st., G. W. Patterson & Son, Nelson, Townsend block, \$64,582; Columbus st., Front st. to Parsons ave., S. T. Knight, Portsmouth, Trimble block, \$25,395.

Dallas, Tex.—Grading Brown st., continuation of Routh, north of the Katy, to a connection with Turtle Creek drive, Doty-Conley Co., 24c. for earth cut, 14c. for fill, 72c. for rock cut, per cu. yd.; Culloom & Vavousett, 19 1/2c.; L. M. Kirkes, 17c. earth, 59c. rock; W. I. Mason, 29c. earth, 18c. fill, 95c. rock; A. F. Moberly, 24c. for earth and 92c. for rock; E. L. Haralson, 30c. for earth and 90c. fill; paving with asphaltic macadam Oak lane, from 4th to Exposition, J. A. Gregory, \$1.32 per sq. yd.; Standard Engineering and Construction Co., \$1.35, or without excavation to subgrade, \$1.28; F. O. Brown, \$1.34; paving 3d ave., Texas and New Orleans to Parry, F. O. Brown, \$1.34 per sq. yd.; J. A. Gregory, \$1.32; Standard Engineering and Construction Co., \$1.35, or without subgrade excavation, \$1.28; 2d ave., from Santa Fe to Grand, F. O. Brown, \$1.34, or without subgrade excavation, \$1.26; J. A. Gregory, \$1.32; Standard Engineering and Construction Co., \$1.35, or without subgrade excavation, \$1.28.

Galveston, Tex.—Bulkheading, surfacing and paving of the road from the west end of Broadway to Causeway; Suderman & Dolson, 13,400 cu. yds. of shell in place, \$1.64 per cu. yd., \$21,976; 9,000 cu. yds. soil in place, \$1.49 per cu. yd., \$13,490; creosoted lumber in place, 60,000 ft., \$60 per 1,000 ft., \$3,600; total for entire work, \$38,986; F. Freund, shell, \$1.64 per cu. yd., \$21,976; soil, \$1.52 per cu. yd., \$13,680; lumber, \$58.50 per 1,000 ft., \$5,510; total, \$39,166; Hanson Sons, shell, \$1.64 1/2, \$22,043; soil, \$1.45 1/2, \$13,005; lumber, \$59.50, \$3,570; total, \$39,518; J. C. Kelso, shell, \$1.69, \$22,646; soil, \$1.44, \$12,960; lumber, \$30, \$1,800; total, \$37,406.

Portsmouth, Va.—Improving streets in Sixth Ward; F. J. McGuire, paving County st., from Chestnut to Blount, exclusive of the Norfolk and Portsmouth Traction Co.'s share, with Mack brick, \$1.55 per sq. yd.; Porter brick, \$1.50; laying 5-in. granite curbing on County and Glasgow sts., 58c. per lin. ft.; paving County st., Blount to Rose, and Glasgow st. and the Air Line turnpike, with tarvia bituminous paving on 8-in. base, \$1.34; with asphalt, \$1.44; grading County st., \$5,000; Pearl st., \$5,000; Glasgow st., \$3,000; paving Traction Co.'s share of County st., \$2,500; Dalby-Nottingham Co., laying 5-in. granite curbing in Glasgow st., 60c. per lin. ft.; grading in Glasgow st., \$3,000; E. Park Lindsay, paving County st., Chestnut to Blount st., with brick, excepting the Norfolk and Portsmouth Traction Co.'s share, \$1.60 per sq. ft.; County st., Blount to Rose st., with tarvia macadam, 8-in. base, \$1.92 1/2 per sq. yd.; add 10c. per sq. yd. for asphalt; same figures apply to Glasgow st.; traction work, add 10 per cent to cost of material and labor; grading Pearl st., \$1,039; County st., Blount to Rose st., \$1,207; Glasgow st., \$2,431; laying 5-in. granite curbing in County st., Chestnut and Blount st., 59 1/2c. per lin. ft.; in County st., Blount and Rose, 62c. per lin. ft.; in Glasgow st., 60c. per lin. ft.

SEWERAGE

Florence, Ala.—City is considering construction of storm sewers at estimated cost of \$12,000.

Ashburn, Ga.—Citizens will vote on \$20,000 bonds for construction of sewer system and water-works.

Barnesville, Ga.—Citizens have voted \$15,000 bonds to extend sewerage, electric light and water systems.

Lawrence, Kan.—Council has decided to construct storm sewers on Euclid and New Hampshire sts.

Ridgely, Md.—Town Council has decided to build a sewerage system; outlet will have to be run nearly four miles to reach nearest creek.

Rockland, Mass.—E. R. Studley, Town Clerk, has been appointed Chairman of Committee to report on proposed construction of sewer system.

Detroit, Mich.—Board of Estimates has allowed \$195,229 appropriation for new sewers.

Amory, Miss.—Citizens have voted \$65,000 bonds for installing sewerage and water-works.—E. C. Dalrymple, City Clerk.

Elizabeth, N. J.—Council has ordered construction of sewer in Jersey ave.—Edw. Nugent, President.

Trenton, N. J.—Council is considering construction of sewers on three streets.—H. E. Salter, City Clerk.

Syracuse, N. Y.—Council has adopted ordinance offered by Alderman Davis declaring intention to construct several sewers in Ninth Ward.

Gresham, Ore.—Bids for construction of sanitary sewerage system will be received about May 29.—L. C. Kelsey, Selling Bldg., Portland, Engineer.

Hillsboro, Ore.—Plans, specifications, etc., have been prepared by Louis C. Kelsey, Civil Engineer, Selling Bldg., Portland, for sanitary and storm sewerage systems and street pavements; sewerage systems are estimated to cost \$83,247.90 and the pavements \$59,355.75; separate contracts will be let for the sewerage and the street paving, and bids for construction will be invited about June 1.

Newport, Ore.—Estimated cost of sanitary sewerage system, according to plans and specifications prepared by Louis C. Kelsey, Consulting Engineer, Selling Bldg., Portland, is \$64,023.83; bids for construction will be invited during the coming summer.—F. B. Davis, City Engineer.

West Middlesex, Pa.—Borough Council has formulated plans for probable construction of sewage disposal plant and taken steps toward having town sewered. (Incorrectly given in April 19 issue as West Midland.)

Aliquippa, Pa.—Architect Owens, Beaver, is drawing plans for sewage system and sewage disposal plant, which will be brought before the Council in a short time. William Anderson, Aliquippa, has been selected as Engineer.

Waco, Tex.—Election on bonds for additional sewers is being considered.

Blacksburg, Va.—Citizens will vote May 16 on \$12,000 bonds to install sewerage and water systems.

Elma, Wash.—Louis C. Kelsey, Civil Engineer, Selling Bldg., Portland, Ore., has been employed by city to prepare plans, specifications and estimates for installing sewerage system.

Oakesdale, Wash.—Council is considering installation of septic tank and sewer system.

CONTRACTS AWARDED

Calxico, Cal.—To Watson & Spicer, Colorado Springs, Col., for construction of sewers, \$26,650.

Chicago, Ill.—Building sewers, to Mich. Pontorelli, 4517 W. Dakin st.; to C. Roberts, 7565 Taylor st.; to J. Savano, 732 Ewing st.; to Simon Ryan, 2927 W. Congress st.; to C. Fosco, 814 Desplaines st.

Evansville, Ind.—Building Morton ave. sewer, to Frank Meguer, 52c. per ft.; \$18 for manholes and \$26 for inlets.

Richmond, Ind.—To Hipskind & Son, Wabash, for installation of sanitary sewer.

Allegan, Mich.—Building sewers, to Peter De Witt, 36 Hope and st., Grand Rapids, \$2,798.82; other bidders: G. W. Edwards, Milan, \$3,376; Swanson Co., Chicago, Ill., \$3,799.40; C. R. Meeks, city, \$3,780.50; Lewis Jagnau, Jackson, \$3,678.20; Hotan & Roach, South Bend, Ind., \$7,747.80; Geo. A. Lowry, Saginaw, \$3,447.85; J. A. Brown & Co., city, \$3,494.—John W. Peete, City Clerk.

Rochester, Minn.—Constructing sewers in Broadway, 4th and 7th sts., to Fraser & Danforth, city, \$6,363.

Roselle, N. J.—Extension of Fifth ave. sewer into Aldene section, to T. Foster Callahan, \$7,317.15; other bidders: Matthew Wade, Elizabeth, \$7,921; Louis Jaques, Elizabeth, \$8,555.55; Martin & Miller, Seneca Falls, N. Y., \$8,731.53.

Albany, N. Y.—Laying sewers in three streets, to John M. Holler, \$784.80, \$1,382.40 and \$2,026.50.

East Aurora, N. Y.—Building sewers, to the Republic Engineering Construction Co., Buffalo, \$75,139.06; disposal plant, to A. C. Bame, Lancaster, N. Y., \$21,719.20.—Alfred Brotherhood, Village President.

Hempstead, L. I., N. Y.—To Cyril Marshall, Hempstead, by Trustees of Village, for construction of proposed sewer system.

Rochester, N. Y.—Building sewer in Rockland st., to F. V. Brotsch, \$1,376.75; Lime st., to Rochester Vulcanite Pavement Company, \$4,965.50.

Schenectady, N. Y.—Laying sanitary sewers in two streets, to John Nolan, city.

Springfield, O.—To Huonker & Williams for construction of Elmwood sewer, about \$14,000.

Providence, R. I.—Pacasset ave. sewer, to Chas. Crankshaw, \$5,666; Elk st., to Gammino & Roberts, \$13,824; Union ave., Tell st. and President ave. sewers, to W. A. Gammino, total \$8,053; sewers on Langham road, 10th and Geneva sts., to F. E. Shaw, \$4,379.

Seattle, Wash.—Building Virginia st. trunk sewer, circular brick, to B. N. Graff, American Bank Bldg., \$14,614.20.

Milwaukee, Wis.—Building 3d st. relief sewer, to R. J. Hickey, \$45,802.

BIDS RECEIVED

East Aurora, N. Y.—Furnishing material and labor for construction of sewer system, including sewage disposal plant, as follows: (a) sewer, (b) disposal plant, (c) sewer and disposal plant: Moore & Smith, Buffalo, N. Y., (b) \$29,265; Baker Owen Construction Co., Johnstown, Pa., (a) \$104,831; Albert Gaffey, Syracuse, N. Y., (b) \$26,922; (c) \$120,458; Duronthe Co., Buffalo, N. Y., (b) \$33,065; Williams & Knowlson, Grand Rapids, Mich., (b) \$26,859; (c) \$118,157; Hydro Construction Co., Buffalo, N. Y., (b) \$29,577; Busch & Percival, Buffalo, N. Y., (b) \$29,228; (c) \$129,509; Alfred C. Bame, Lancaster, N. Y., (b) \$21,719; John E. Johnson & Co., Buffalo, N. Y., (a) \$91,865; Cusano & Power, Niagara Falls, N. Y., (a) \$88,730; John D. Kuhn, Greensburg, Pa., (a) \$76,325; James Duff Construction Co., Cleveland, O., (b) \$24,370; (c) \$115,888; Joseph F. Slabele Co., Buffalo, N. Y., (b) \$21,730; (c) \$101,848; Gray & Miller, Hornell, N. Y., (a) \$79,657; Republic Engineering and Construction Co., Buffalo, N. Y., (b) \$24,400; (c) \$99,757.

Mount Vernon, N. Y.—Construction of a sewer in East Lincoln ave., Louis Petrillo, \$13,518; Sabino Guarino, \$12,760; Smith Bros., \$11,912; Tony Lougo, \$12,489; James Piro, \$11,087; Charles Motolla, \$10,750; Frank Nordone, \$12,970; Inter-Urban Development Co., \$14,917; Charles Sillery & Sons, \$11,950.

Nashville, Tenn.—John Broderick was lowest bidder for building sewer in alley 268, \$1,177.

Prince Albert, Sask., Can.—Constructing main intercepting sewer: Wm. Newman Co., Ashdown Block, Winnipeg, Man., \$83,234; Maudeas Bros., 544 Front St., Edmonton, Alta., \$120,987; John Craig, Prince Albert, \$125,667; Power Construction Co., Saskatoon, \$126,828; Flannagan & Dunphy, Dauphin, Man., \$144,700, and Parsons Const. & Eng. Co., Regina, Sask., \$165,428; work includes following: 13,031 lin. ft. concrete egg-shaped sewer, 4 to 4 ft. 6 in.; 355 junctions, 16 manholes, 2 penstock manholes, 462 lin. ft. 18-in. pipe sewers, 1 manhole on pipe sewer; cast iron for manholes and penstocks and sewer pipe for 18-in. sewer are supplied by city; all other materials and labor is supplied by contractors; average depth of trench, 12½ ft.

WATER SUPPLY

Attalla, Ala.—Etowah Light & Power Co. will improve water and electric light systems at cost of \$50,000; 20-year franchise has been granted.

Gadsden, Ala.—Citizens have voted \$50,000 bonds for water works improvements.

Washington, D. C.—Inquiry has been received by American consular officer in Mexico for names and addresses of American manufacturers of cast iron pipes and iron pipes.—Address No. 6568, Bureau of Manufactures.

Fort Lauderdale, Fla.—Water-works system will be installed during year.—W. H. Marshall, Mayor.

Ashburn, Ga.—Citizens will vote on \$20,000 bonds for construction of water-works and sewer system.

Barnesville, Ga.—Citizens have voted \$15,000 bonds to extend water, electric light and sewerage systems.

Oglethorpe, Ga.—City will construct water-works; bids will be opened about July 1; engineer not selected.—C. A. Allison is interested.

Swainsboro, Ga.—Citizens have voted \$40,000 bonds to install water works and electric lights.

Preston, Ida.—Citizens have voted bonds for installation of municipal water works system.

New Athens, Ill.—Village Board has passed ordinance for construction of system of water works.

Sterling, Ill.—Sterling Water Co. will make extensions to system throughout city; cost, \$75,000.—J. D. Arey, City Engineer.

Evansville, Ind.—Water Works Board has recommended installation of 16-in. water main in Adams ave. at cost of \$12,000.

Leesburg, Ind.—Establishment of water works system is being considered.

Baxter, Ia.—Citizens will vote on \$10,000 bonds for installation of water works.

Roland, Ia.—Citizens have voted \$10,000 bonds for installation of water works system.

Sioux City, Ia.—Council has rejected bids for pump for Morningside station; new bids will be asked.

Sully, Ia.—Citizens have voted \$8,500 bonds for installation of water supply system.

Vail, Ia.—Citizens have voted bonds for installation of water works system.

Amesbury, Mass.—Town has sold \$12,000 water bonds.

Hastings, Mich.—Citizens have voted \$120,000 bonds for construction of a water

power plant.—James M. Patten, City Clerk.

St. Cloud, Minn.—Mayor P. J. Sebergen has recommended installation of filtration plant.

Taconite, Minn.—Duluth Eng. Co., Duluth, has been selected as engineer for proposed water-works; cost about \$15,000.

Amory, Miss.—City voted \$65,000 bond issue for installing water-works and sewerage.—E. C. Dalrymple, City Clerk.

Helena, Mont.—Construction of the municipal water works plant, C. L. Morris Construction Co., Seattle, Wash., \$618,840; Adami Bros. & Co., Helena, \$648,419; P. E. McHugh, Tacoma, Wash., \$646,000; Engineer's estimate, \$606,000; the Helena Water Works Co., April 17, made offer of its plant, complete, for \$400,000, which is \$190,000 less than the offer of March 6; Council has rejected all bids in order to consider offer.—Charles W. Helmick, City Engineer.

Pacific, Mo.—The Fuller-Coult Co., Chemical Bldg., St. Louis, is making profiles and estimates for water-works.

Pleasant Hill, Mo.—Council has granted 20-year franchise to C. W. Dobbins for construction of water-works; proposes to construct dam.

Diller, Neb.—D. F. Sturdevant, Holdrege, Engineer, will supervise installation of water works plant.

Maimo, Neb.—Citizens have voted bonds for installation of water works.

Central Valley, N. Y.—Commonwealth Water Co., New York, is considering installation of chemical filter.

Cortland, N. Y.—Board of Water Commissioners is preparing to build 1,000,000-gal. standpipe or water storage tank at top of Court House hill; George F. Cooper and Grove T. Mason are committee to prepare plans and specifications for both open hearth and ingot iron construction, as well as of any other material they will recommend.

Portland, N. Y.—E. A. Wilder, Fredonia, will prepare preliminary plans and estimates for diversion channel around present impounding reservoir with necessary dams and connections; estimated cost, \$15,000 to \$20,000.

Sodus, N. Y.—Installation of water-works is being considered.

Concord, N. C.—City has \$50,000 bond issue available for construction of water-works.

Petersburg, N. D.—Citizens have voted \$6,000 bonds for installation of water works system.

Kenton, O.—Bids will be asked about June 1 by the city for constructing partly new and remodeling old water works.—Charles Brossman, Indianapolis, Ind., Engineer; V. H. May, Superintendent Water Works.

Springfield, O.—City will ask for bids for material for proposed water works force main and for the supply of pipe for season.—George Cotter, Superintendent Water Works.

McAlester, Okla.—Citizens have voted \$80,000 additional bonds for water works improvements.

Oklahoma City, Okla.—National Board of Fire Underwriters has recommended replacing dam with one of permanent construction; installation of two additional high-lift pumps; installation of two additional boilers and extension of distribution system.

Oklahoma City, Okla.—Bids for proposed new sedimentation basin at water works plant, to take care of extra amount of water consumed during summer months, have been rejected, because they exceeded estimates of Vincent G. Shinkle, Superintendent of the department, who prepared them; will be readvertised; bidders were: Hunter & Hunter, \$13,130; John A. Johnson, \$14,587; Fielder & Co., \$13,992; J. W. Smith & Co., \$13,800; Oklahoma City Construction Co., \$16,500; Stokes Construction Co., \$14,630; Illinois Concrete Machine Co., \$32,400; Black & Laird Construction Co., \$15,990; George H. Kelfer, \$13,917.

Soper, Okla.—City will receive bids on 110 tons c.-i. pipe, 30,000-gal. steel tank on tower, deep-well geared pump, 12-hp. gasoline engine, 10 hydrants, valves, etc.—H. Hughes, City Clerk.

Soper, Okla.—Citizens have voted bonds for installation of water works system.

Gresham, Ore.—Bids for construction of the water works distributing system and sanitary sewerage system will be received about May 29.—Louis C. Kelsey, Selling Bldg., Portland, Ore., Engineer.

Haines, Ore.—Citizens have voted \$20,000 bonds to install water works system.

North Bend, Ore.—Mayor has authorized J. L. Stannard, Portland, to prepare plans and specifications for municipal water-works to supply both Marshfield and North Bend.

Franklin, Pa.—Council has passed resolution for construction of city water main to Oak st. in Tenth Ward at estimated cost of \$4,735.

McKeesport, Pa.—Board of Water and Lighting Commissioners is considering rebuilding of pumping station.—D. M. White, Superintendent.

Wyomissing, Pa.—Council will consider \$60,000 bond issue for municipal water and light plant.

York, Pa.—Water Co. has decided to spend \$15,000 to extend trunk line through northern and western sections of the city.

Hearne, Tex.—Citizens have voted bonds to install water works.

Port Lavaca, Tex.—W. E. Shell has petitioned City Commissioners for franchise for water-works and electric light system.

Princeton, Tex.—Princeton Water-Works Co. will expend \$7,500 on water-works construction; erect engine and pump house; install 10-hp. oil engine and 20,000-gal. tank.

Blacksburg, Va.—Citizens will vote May 16 on \$12,000 bonds to install water and sewerage systems.

Christiansburg, Va.—Citizens have voted \$40,000 bonds to install water works.

Rocky Mount, Va.—Citizens will vote June 14 on \$50,000 bonds to establish and operate water works and electric light plant.

Elma, Wash.—Louis C. Kelsey, Civil Engineer, Selling Bldg., Portland, Ore., has been employed by city to prepare plans, specifications and estimates for increasing water supply by means of pumping and for installation of sewerage system.

Tacoma, Wash.—Bids will be asked at once for construction of 54-in. stove pipe line from main reservoir at McMillan to Wright ave. and J st. and for construction of telephone line along pipe line.

Independence, Wis.—Water system will be installed; \$3,500 bonds issued.

Monticello, Wis.—Consulting Engineer W. G. Kirchoffer, Madison, has been employed to prepare plans for water works system, consisting of 8,000 ft. of 6-in. and 8-in. c.-i. pipe; a concrete reservoir or elevated tank, one deep well and a power pump; plant will be operated by engine and boilers now located in electric light plant.

Niagara-on-the-Lake, Ont., Can.—Village is planning to install water works at cost of \$21,500.

CONTRACTS AWARDED

Chicago, Ill.—Furnishing and laying water service pipes, to Jas. T. Renn, 367 W. Chicago ave.; to Daniel Hardin, 3139 Indiana ave.; to David Walsh, 6628 S. Chicago ave.; furnishing and laying c.-i. water supply pipes, to Simon Ryan, 2927 W. Congress st.; to M. Murphy, 5315 Wabash ave.

Nevada, Ia.—To Guy E. Smith, Indianola, for constructing water-works.

Baltimore, Md.—By Board of Awards, for 1,300,000-gal. vertical, triple-expansion pumping engine for the Mount Royal Pumping Station, to Allis-Chalmers Co., \$166,336.

South Hadley Falls, Mass.—To John E. Palmer, Boston, contracting engineer, for laying 27,700 ft. of water pipe for Fire District No. 2 and setting of 35 hydrants; to Daniel O'Connell Sons, to erect pumping station.

Alexander, Minn.—To W. B. Bosworth, Ada, by city, for construction and installation of water mains in 6th ave.

Duluth, Minn.—Laying 19,714 ft. of water pipe and 19,930 ft. of gas pipe: Crescent View extension, Woodland ave. to Crescent View Park, 4,382 ft. 8-in. water and 4-in. gas pipe and 2,770 ft. 6-in. water and 4-in. gas pipe, to J. Bergman, \$8,141.44; total estimated cost, \$14,000; Fourth alley force main, 2,040 ft. 20-in. water and 8-in. gas pipe, to Pastoret-Lawrence Co., \$2,694.80; total estimated cost \$9,767.38; 1,008 ft. 6-in. water and 4-in. gas mains, to Woodland, Johnson & Johnson, \$651.84; total estimated cost, \$1,720; 540 ft. 6-in. water and 4-in. gas mains in 43d ave. West, to Adam McAdams, \$313.20; total estimated cost, \$868; 2,350 ft. 6-in. water and 4-in. gas mains in Lewis st. and Dunnedin ave., Hunters' Park, to Johnson & Johnson, \$1,518.68; total estimated cost, \$3,650; also smaller contracts, to J. Bergman, J. W. Preston and Adam McAdams.

Hastings, Neb.—To Ingersoll-Rand Co., Chicago, to furnish for the city pumping station new air compressor of a capacity of 1,193 ft. of air per minute.

St. Paul, Neb.—To J. P. Johnson & Son, St. Paul, for the construction of extensions to water works; materials for the work have already been purchased.

Rochester, N. Y.—Laying water pipes in streets comprising group 247, to Wm. H. Sours, Second, \$23,882.

Troy, N. Y.—To the McDonough Construction Co., of Troy, for construction of the Martin-Dunham reservoir and spillway, \$15,276; to Ludlow Valve Mfg. Co., for valves; to R. D. Wood & Co., Philadelphia, Pa., for c.-i. pipe.

Cincinnati, O.—Service Director Sundmaker for wash water pumps and motors

for filtration plant, to L. G. Findlay & Co., \$3,440.

Salt Lake City, Utah.—To P. J. Moran, for construction of city's water main extensions during 1911; only other bid submitted was that of J. W. Percival.

Seattle, Wash.—Laying water mains on Grand blvd., to Jahn Contracting Co., Leary Bldg., \$16,408.60.

Richland Center, Wis.—To the Heine Chimney Co., Chicago, Ill., for erection of chimney.

BIDS RECEIVED

Tucson, Ariz.—Construction of a reinforced concrete standpipe, plain and ornamental finish: Geo. Cook & Co., \$16,150 and \$16,564, respectively; V. S. Griffith, \$16,450; Piedmont Construction Co., \$17,750 and \$19,590; Petterson & Schmidt, \$18,250 and \$18,955; Welch & Co., \$20,000; Barman Construction Co., \$25,116.

Fort Baker, Cal.—By Major George McK. Williamson, Q. M., U. S. A., for reconstructing pump house, installing machinery, erecting a steel tank and laying 6-in. water main at Fort Baker, (a) for entire work, (b) reconstructing pump house, (c) installing machinery, (d) steel tank, (e) 6-in. water main; Braun, Williams & Russell, 503 Market st., (d) \$2,795; F. C. Roberts & Co., 461 Market st., (a) \$14,725; American Construction Co., 359 Monadnock Bldg., (b) \$3,160, (d) \$3,564, (e) \$4,485; Compressed Air Machinery Co., Stevenson & Ecker, (a) \$18,838, (b) \$2,723, (c) \$6,765, (d) \$4,987, (e) \$4,143; Duncanson Harrison, 1407 Chronicle Bldg., (a) \$22,890, (b) \$6,985, (c) \$6,895, (d) \$4,445, (e) \$5,900; H. W. Moffit & Co., Oakland, Cal., (a) \$15,994; Butte Engine and Electric Co., 683 Howard st., (a) \$17,178, (b) \$2,288, (c) \$5,500, (d) \$4,102, (e) \$5,288; Pringle, Dunn & Co., 338 Pine st., (a) \$15,477, (b) \$1,947, (c) \$5,225, (d) \$4,262, (e) \$4,480; Nelson Bauer, Metropolis Bank Bldg., (a) \$18,075, (b) \$3,250, (c) \$5,032, (d) \$4,095, (e) \$4,985; Michael Murphy, Berkeley, Cal., (e) \$4,750; Chambers & Heafey, Oakland, Cal., (a) \$16,141, (b) \$2,905, (c) \$4,980, (d) \$3,600, (e) \$4,956; George E. Dow, 410 Sheldon st., (c) \$4,850; Sampson Iron Works, Stockton, Cal., (c) \$4,575; all bidders of San Francisco unless otherwise stated.

Washington, D. C.—Furnishing pipe, etc., c.-i. water pipe: Item (1) 811 tons 16-in., (2) 1,125 tons 20-in., 9-in. thick, (4) 475 tons 20-in., 6-in. thick, (3) 90 tons (a) specials on standard specifications, (b) on bidder's specifications: U. S. Cast Iron Pipe and Foundry Co., New York, Items (1-3) \$22.84, (4) \$54.84; Standard Cast Iron Pipe and Foundry Co., Bristol, Pa., Items (1-2) \$24.80, (3) \$24.58; (4a) \$51.50; Lynchburg Foundry Co., Lynchburg, Va., Items (1-3) \$24.02, (4b) \$52.60; Camden Iron Works, Camden, N. J., Items (1-3) \$24.02, (4b) \$52.60; Cocks: Item (1) 4,000 $\frac{3}{4}$ -in. corporation cocks, (2) 200 $1\frac{1}{2}$ -in. corporation cocks, (3) 250 $\frac{3}{4}$ -in. lead corporation cocks, (4) \$4,250 $\frac{3}{4}$ -in. iron curb cocks, (5) 150 $\frac{3}{4}$ -in. lead and iron curb cocks: H. Mueller Mfg. Co., New York, (1) 60.75c., (2) \$2.40, (3) 71.5c., (4) 77c., (5) 77c.; 82.5c. on solid curb cocks; A. P. Smith, East Orange, N. J., (1) 59c., (2) \$1.96, (3) 62c., (4) 72c., (5) 77c.; Walworth Mfg. Co., Boston, Mass., (1) 67c., (4) 85.6c.; Glauner Brass and Mfg. Co., Cleveland, O., (1) 58.5c., (2) \$2.18, (3) 86c., (4) 81c., (5) 82c.; Hayes Mfg. Co., Erie, Pa., (1) 58.5c., (2) \$2.22, (3) 58c., (4) 63c., (5) 63c.

Fulton, N. Y.—Furnishing 300 tons of 18-in. and 70 tons of 14-in. pipe, and 1,200 lbs. of 14-in. and 5,000 lbs. of 18-in. Standard castings: Charles Millar & Son Co., Utica, N. Y., \$21.40 per ton for pipe, and \$50 per ton for special castings; U. S. Cast Iron Pipe and Foundry Co., \$21.40 and \$50.

Niles, O.—Installing clear well and filtration plant: Youngstown Construction Co., Youngstown, \$63,390; Louis Adavasio & Co., Youngstown, \$47,400; W. H. Ralston, Mt. Vernon, \$48,900; Ensminger Co., Columbus, \$34,455; Niles Lumber Co., Niles, O., \$48,300; Falken Electric Co., Chicago, \$73,500; Clarendon Construction Co., Wilmington, N. C., \$49,086; Roberts Filter Mfg. Co., Philadelphia, Pa., \$49,100; Pitts Construction Co., Pittsburg, Pa., \$46,000; the American Water Softening Co., Philadelphia, Pa., \$57,239.50; R. P. Burnett, Geneva, O., \$41,000; Pittsburg Filter Co., Pittsburg, Pa., \$48,865; W. N. Henderson, Youngstown, \$45,225; furnishing the pumps, Harris Pump and Supply Co., Pittsburg, \$2,760; Goulds Mfg. Co., Seneca Falls, N. Y., \$4,130; the Allis-Chalmers Co., Milwaukee, \$3,100; the Drava-Doyle Co., Cleveland, \$3,240; Henry R. Worthington, Cleveland, \$2,940; Lathburg D'Oiler Co., Philadelphia, \$3,670; Jeanesville Iron Works Co., Broadway, N. Y., \$2,802.27; Platt Iron Works Co., Dayton, O., \$2,687.

Norwalk, O.—Furnishing 12, 10, 8, 6 and 4-in. water pipe and special castings to be used for construction of the water pipe extensions on Woodlawn ave., Corwin, East

Main, Chatham and St. Mary's sts., Buckeye Engineering Co., Norwalk, lowest bidder, \$23.25 per ton.

Lebanon, Pa.—Furnishing horizontal, cross-compound crank and flywheel condensing cross-compound pumping engine of 2,500,000-gal. capacity per 24 hours, (a) with foundation, (b) without foundation, (c) duty in millions of foot lbs. per 1,000 lbs. dry steam: Snow Pump Works, Buffalo, N. Y., (a) \$14,075, (b) \$13,500, (c) 122; Allis-Chalmers Co., Milwaukee, Wis., (a) \$16,650, (b) \$15,100, (c) 118; Platt Iron Co., Dayton, O., (a) \$14,140, (b) \$13,548, (c) 115.

Pittsburg, Pa.—Mission st. pumping station building and appurtenances: William Kerr's Sons, Lewis Bldg., Pittsburg, \$93,200; Golden & Crick, \$94,194; W. T. Powell, \$94,358.

Dallas, Tex.—Furnishing three 250-hp. boilers for White Rock reservoir: John O'Brien Boiler Works Co., St. Louis, \$8,500; Oil City Boiler Works, Oil City, Pa., by M. P. Wolfe, \$9,895; Smith & Whitney, \$10,300; E. Keeler Co., Williamsport, Pa., by John G. Hunter, \$8,529; Babcock & Wilcox Co., New Orleans, \$13,715; Randall-Lovegrove-Wyman, Houston, \$9,615; Casey Hedges Co., Chattanooga, by A. G. Wright, \$9,636; Eriggs-Weaver Machinery Co., \$8,750; Walsh & Weidner Boiler Co., Chattanooga, \$8,690.

Tacoma, Wash.—Building McMillan Reservoir and pipe line, the remaining units of the Green River gravity water system: Pipe Line—Pacific Coast Pipe Co., \$767,927.75; Nisqually Contract Co., \$771,711.65; B. W. Kibler, \$778,356.64; Morris Construction Co., \$784,316; Jahn Construction Co., \$790,432.74; P. E. McHugh, \$798,453.37; Sound Construction Co., \$810,208.89; International Contract Company, \$858,846.26; Reservoir—Nelson Bennett, \$289,589.22; Northwest Contract Co., \$297,144.96; Robert Wakefield Co., \$304,328.40; United Reservoir Construction Co., \$309,754.81; Keasal Construction Co., \$305,794.52; Sound Construction Co., \$326,200.62; Nisqually Contract Co., \$328,752.43; Morris Contract Co., \$342,403.66; International Contract Co., \$349,556; Lister Construction Co., \$302,062.62.

LIGHTING AND POWER

Attalla, Ala.—Etowah Light & Power Co. will improve electric light and water systems at cost of about \$50,000; 20-year franchise has been secured.

Hawthorne, Cal.—Board of Supervisors has formed lighting district.

Los Angeles, Cal.—Better street lighting in the southeast section of the city is recommended to Board of Public Works by R. H. Manahan, City Electrician.

Los Angeles, Cal.—Board of Supervisors has refused Southern California Gas Co.'s application for franchise giving it privilege of laying gas pipes on all highways of county.

Quincy, Cal.—President O. C. Pratt, of Indian Valley Power Co., now supplying Greenville, has announced that line will be extended immediately to Taylorsville and Crescent Mills; plant will be enlarged and two towns lighted by electricity this summer.

Sacramento, Cal.—Citizens Light and Power Co. has been incorporated by Geo. Peltier to construct generating plant and supply electric current for light and power, also gas; capital, \$2,500,000.

Georgetown, D. C.—Georgetown Gaslight Co. is planning to build plant costing about \$500,000.

South Jacksonville, Fla.—Citizens have voted \$60,000 bonds for construction of electric light system and water works.—R. O. Moore, Chairman, Board Bond Trustees.

Atlanta, Ga.—Atlanta Hydro-Electric Power Co., 1014 Candler Bldg., is completing plans for construction of water-power electrical plant; \$3,000,000 will be expended for construction of high dam and power house, installation of machinery for developing 30,000 hp., and construction of transmission line to city.

Barnesville, Ga.—Citizens have voted \$15,000 bonds to extend electric light, water and sewerage systems.

Buchanan, Ga.—City will construct electric light plant.—G. N. Moore and H. S. McCalman, Committee in Charge of purchase and installation.

Oglethorpe, Ga.—City will open bids about July 1 for electric light and water plants construction; engineer not selected. C. A. Allison is interested.

Elwood, Ind.—Bacon-Olds Co. will build artificial gas plant in city.

Marion, Ind.—Board of Public Works has passed resolution granting to John L. McCulloch, city, a petition to furnish citizens artificial gas at price of \$1 per thousand cu. ft.

Muncie, Ind.—Martin Sears and L. Dunham, Yorktown, are working on organization of electric lighting company to furnish

light to incorporated towns of Daleville, Chesterfield and Yorktown, and to farmers between these towns.

Bonaparte, Ia.—J. A. Johnson and others are considering installation of electric light plant.

Fort Dodge, Ia.—Council has passed motion instructing City Engineer Reynolds to run level from city pumping station north for one-half mile to determine feasibility of dam for municipal power purposes.

Humboldt, Ia.—Northern Roller Milling Co. and the Humboldt Electric Light and Power Co., both operated under the same management, will at once build concrete dam across Des Moines River, and will also construct large power house near present one; about \$80,000 will be spent; plant will develop 1,200 horsepower.

Milo, Ia.—Citizens have voted bonds for establishment of municipal gas lighting plant.

Lake Charles, La.—J. S. Connolly, Carthage, Mo., will petition Council for franchise for gas plant.

Shreveport, La.—Council has decided to have estimate made of probable cost of electric light plant.

Chestertown, Md.—Council has granted franchise for gas plant in town.

Brainerd, Minn.—Council has adopted resolution asking Water and Light Board to expend \$1,800.75 for rectifier system of street lighting.

Minneapolis, Minn.—Dr. P. M. Hall, Health Commissioner, is preparing plans for enlarging city incinerating plant and increasing number of the electric generators so as to enable the plant to supply enough electricity to light up workhouse, Hopewell hospital, and 20 miles of streets in vicinity of workhouse.

St. Vincent, Minn.—Installation of electric light plant at cost of \$4,000 is being considered.

Wabasha, Minn.—Plans are being considered for establishment of the Minnesota Wisconsin Power Co. to furnish light and power to the cities of Wabasha, Lake City, Red Wing, Hastings and Winona; current will be furnished from the plant in this city, which will be enlarged to meet the increased demand.

Tupelo, Miss.—Citizens have voted \$50,000 to improve electric light plant, pave streets, etc.

Bloomfield, N. J.—Mayor Hauser has recommended installation of municipal electric light plant.

Madison, N. J.—Repairs, alterations and increased equipment for the local electric lighting plant that will total \$18,000, plus fees for preparing plans and supervising construction, have been outlined in report submitted to Council by New England Engineering Co.

Newark, N. J.—Committee on Municipal Lighting is planning to extend city hall lighting plant in order to light public buildings at cheaper rate.

Vincetown, N. J.—Water Co. is considering installation of generator to supply electricity for lighting town.

Albany, N. Y.—Proposition of the Municipal Gas Co. to light streets of the city of Albany for a period of five years from June 21 has been unanimously rejected by Board of Contract and Supply.

Binghamton, N. Y.—Council has asked Board of Estimate that \$250 be appropriated to procure services of electrical engineer to make plans for boulevard lighting and placing wires in conduits.

Oxford, N. C.—Oxford Electric Co. has been incorporated, \$15,000 capital stock, by A. H. Powell, of Oxford; Richard C. M. Calvert, of College Park, Md., and Charles F. Nesbit, of Washington, D. C., to furnish electric power and lighting and gas.

Dickinson, N. D.—Hughes & Deiters, owners of electric light plant, are planning extensive and permanent improvements.

Akron, O.—The Northern Ohio Traction and Light Co. has decided to develop water power on the Cuyahoga River near this city; Consulting Engineer H. von Schon, Detroit, Mich., is preparing plans.

Kingfisher, Okla.—Citizens have voted \$28,000 bonds for enlargement of electric light plant and extension of water-works; electric light system will be changed from single-phase to three-phase.—V. H. Francis, Superintendent of Light and Water plant.

Steelton, Pa.—Steelton Light, Heat and Power Co. is considering erection of auxiliary plant having 400-hp. dynamo.

Union City, Pa.—Keystone Electric Light Co. has been granted franchise to erect poles and string wires in streets; will build electric light plant. L. D. Shreve is interested.

Wyomissing, Pa.—Council will consider \$60,000 bond issue for municipal light and water plant.

Columbia, S. C.—Columbia Gas Light Co. is considering improvements to system.

Edgefield, S. C.—Citizens will vote May 18 on \$15,000 bonds for electric light plant.

Granbury, Tex.—Granbury Water, Ice, Light & Power Co., James W. Hockaday, Manager, desires 100-hp. power gas producer and engine.

Hearne, Tex.—Citizens have voted bonds to install electric lights.

Longview, Tex.—Citizens have voted \$90,000 for electric lighting facilities, paving, etc.—G. A. Bodenheimer, Mayor.

Port Lavaca, Tex.—W. E. Shell has petitioned City Commissioners for franchise for electric light system and water works.

Temple, Tex.—J. A. Walker, 4210 Lafayette st., Dallas, desires prospective plans, specifications and construction bids on complete gas plant; 100,000 cu. ft. capacity; 50,000-ft. holder; five miles main, 8, 6, 4, 2-in.

Troup, Tex.—R. C. Schumate, Zephyr, has purchased electric light plant and will improve.

Rocky Mount, Va.—Citizens will vote June 11 on \$50,000 bonds to establish and operate electric light plant and water works.

La Crosse, Wis.—Plans for construction of fourth dam and another power house are being prepared by La Crosse Water Power Co.

Sun Prairie, Wis.—Citizens will vote May 9 on \$9,000 bonds for installation of electric light plant.

CONTRACTS AWARDED

Pasadena, Cal.—To S. M. Kerns, Los Angeles, to construct underground conduit system for electric light and telephone wires on South Orange Grove ave., \$33,700.

Taunton, Mass.—Lighting naphtha lights at northern end of the city, viz., Bassett, Fremont, Field and other streets, to James Barry, \$2,400.

Jackson, Tenn.—Furnishing generator and arc lamps, to the General Electric Co., of Schenectady, N. Y., and engine, to Hoover, Owens, Rentschler Co., Hamilton, O.; total cost, \$14,750.

Galveston, Tex.—Supplying fifty-set transformer and twenty-five new arc lamps, to the General Electric Company.

BIDS RECEIVED

Baltimore, Md.—McKay Engineering Co., 10 East Lexington st., is lowest bidder for installing ornamental lampposts about City Hall plaza and Key monument.

Seattle, Wash.—Furnishing machinery for Lake Union plant generator: Westinghouse Electric Co., \$9,424; Fort Wayne Electric Works, \$9,558; S. Morgan Smith Co., Bates & Clark Co., \$9,987; E. P. Jamison & Co., \$12,480; Water wheel: the Platt Iron Works Co., \$7,690; E. P. Jamison & Co., \$7,500; Pelton Water Wheel Co., \$6,350 and \$6,670.

FIRE EQUIPMENT

East Holly, Cal.—Council is considering purchase of chemical engine.

Ocean Park, Cal.—City Clerk Watt will receive bids for auto truck for city fire department within two weeks.

New Britain, Conn.—Fire Chief R. M. Dome has recommended purchase of 500 ft. of 3¼-in. hose and equipment of truck with ladders.

Stratford, Conn.—Fire house will be erected at Nichols and Johnson aves. Wm. Clements is interested.

Bridgeville, Del.—Volunteer Fire Department is considering erection of \$3,000 fire house.

Dalton, Ga.—City has purchased site on Pentz st. for erection of combined fire headquarters and city hall.

Sterling, Ill.—Bids will soon be asked by Fire and Water Committee for combination auto fire truck carrying ladders and hose.

Princeton, Ind.—Council is considering purchase of fire engine.

Neola, Ia.—Council has decided to erect fire engine house.

Baltimore, Md.—City will erect engine house in near future at Light and Montgomery sts.

Greenfield, Mass.—Town has appropriated \$6,000 to purchase motor-propelled combination chemical and hose wagon.

Gloucester, Mass.—Town is considering purchase of flying squadron.

Swampscott, Mass.—Town has appropriated \$6,000 for purchase of auto chemical and hose wagon.

St. Cloud, Minn.—Mayor P. J. Sebergers has recommended erection of engine house.

Waterloo, Neb.—Citizens have voted \$15,000 bonds for better fire protection.

Westfield, N. J.—Fire Committee is considering purchase of auto apparatus.—J. A. Dennis, Mayor.

Old Forge, N. Y.—Village is considering erection of combined engine house and municipal building.

Sauquoit, N. Y.—Purchase of chemical engine is being considered.

Syracuse, N. Y.—Fire alarm ordinance has been adopted without opposition by

Council and early action will be taken to contract for installation of central office equipment.

Troy, N. Y.—Council has passed ordinance for purchase of truck.

Columbus, O.—Mayor Marshall is favorable to purchase of auto fire apparatus.

Boyetown, Pa.—Keystone Fire Co. will purchase fire engine.

Dunmore, Pa.—Plans for erection of two new fire houses are being prepared by Architect P. J. Morris, of Scranton.

Lansford, Pa.—Council has decided to install borough electric fire alarm system.

Harrisburg, Pa.—Council is considering purchase of 2,500 ft. of fire hose.

Pottstown, Pa.—Council is considering purchase of modern truck for Empire Hook and Ladder Co.

Sellersville, Pa.—Fire company has been organized.—Fred Shubert, Chief.

Sellersville, Pa.—Council has agreed to furnish equipment for local fire company, and proper building will be erected.

Seven Valleys, Pa.—Fire company has been organized.—H. S. Behler, Chief.

Columbia, S. C.—Engine house will be erected at once at 1112 Green st.

Fort Worth, Tex.—Plans for expending \$45,000 in equipping adequate police and fire alarm system have been approved by Commission.

Spokane, Wash.—Fire Commissioners are considering election on \$100,000 bonds for extension and improvements in fire department.

Tacoma, Wash.—Council is considering purchase of site in Indian addition for erection of fire house.

Montreal, Que., Can.—Board of Control has ordered erection of two fire stations.

CONTRACTS AWARDED

Hartford, Conn.—Building 55-ft. water tower, to American-La France Fire Engine Co., Elmira, N. Y., \$6,000.

Lawrence, Mass.—Furnishing auto combination chemical and fire truck, to Knox Automobile Co., Springfield, \$5,500.

New York, N. Y.—By Board of Estimate, to Star Electric Co., Binghamton, N. Y., for installation of several thousand dollars' worth of fire-alarm boxes.

BIDS RECEIVED

Chico, Cal.—Furnishing automobile engine, Pope-Hartford, \$5,500; Rambler, \$5,250; Webb Motor Fire Apparatus Co., \$5,750; Gorham Engineering and Fire Apparatus Co., makers of the Seagrave chemical engine, three bids, \$5,105, \$5,055, \$5,755; White, \$4,590; Knox, new, \$5,980; used, \$5,630; Kissel, \$5,300.

St. Paul, Minn.—Furnishing motor-driven squad wagon: Waldref-Odell Motor Car Co., \$6,000; Webb Motor Fire Apparatus Co., \$5,000; Knox Automobile Co., \$5,600; Robinson Fire Apparatus Co., \$5,500; P. J. Downes Co., \$5,000; Watrous Engine Works, \$5,500; American-La France Fire Engine Co., \$5,500.

Paterson, N. J.—Changing of the hose wagons and engine apparatus attached to steamer companies Nos. 1 and 5; William J. Tynan sent in two bids, first for changing of the two hose wagons to motor propelled vehicles for the sum of \$7,300, and second for the same work, substituting Knox chassis for a Sampson chassis, \$6,000; Hughes Garage Co., on a Kelly truck chassis, \$7,000; James Boyd & Sons, two hose wagons, \$6,375; Seagrave Co. bid \$5,000 each for changing of two wagons and \$5,500 each for changing of the two engines; the Nott Fire Engine Co. offered to install universal chassis similar to that in present use in the motor propelled steam fire engine in New York department for the sum of \$6,000 for each engine; Couple Geering Co., New York, offered to install electric driven tractor for engines at a cost of \$5,500 each; Victor Motor Truck Co., for engines, \$7,000; Webb Motor Fire Apparatus Co. bid on 75-hp. hook and ladder motor-propelled truck, \$12,600.

Hamilton, O.—Furnishing auto trucks and other fire department equipment: Auto trucks, West Side Motor Co., two trucks, \$4,300 each without equipment or \$4,950 with equipment; American-La France Co., Elmira, N. Y., \$5,200 and \$5,000; Seagrave Co., Columbus, \$7,800 and \$8,250 for two trucks, ladder wagon, aerial, \$5,000; Hamilton Motor Car Co., \$7,000 for two or \$3,500 for one truck; Central Motor Car Co., one motor wagon, \$5,000. Hose: Bi-Lateral Fire Hose Co., Chicago, \$1, 95c., 90c. and 80c. per ft. for 3,400 ft., according to brand; J. R. Mudoon, Dayton, made general bid on clay pipes, nozzles, gate valves, etc.; Diamond Rubber Co., Akron, fire hose, \$1, 90c. and 80c. per ft.; Fabric Fire Hose Co., New York, \$1.10, \$1, 95c., 90c. and 85c. per ft.; Boston Woven Hose and Rubber Co., 90c. and 85c. per ft.; Eureka Fire Hose Co., New York, \$1.10, \$1, 90c., 95c. and 85c. per ft.

South Bethlehem, Pa.—Supplying 1,000 ft. of Fire Hose: Hudson Mechanical Rubber Co., No. 1, 69½ cts. per ft.; No. 2, 52½ cts.; No. 3, 46 cts.; No. 4, 34 cts., all coupled; Bi-Lateral Fire Hose Co., Progress, double jacket, \$1.10 per ft.; Ohio, double jacket, \$1, coupled; Mineralized Rubber Co., double jacket, 78 cts., and 90 cts., coupled; Voorhees Rubber Manufacturing Co., 4-ply Conqueror, \$1.10; Overall, \$1; Kearney brand, \$1; double jacket, 90 cts.; C. C. Fire Hose & Rubber Co., Gold Standard, \$1; Canton Special, \$1; Standard, 90 cts.; Independence brand, solid rubber, \$1.10; Gutta Percha & Rubber Manufacturing Co., Ajax, 75 cts.; Princeton, 70 cts.; Maltese Cross, \$1.25; Baker Fabric, \$1.20; Baker Fabric, \$1; Princeton, double jacket, 95 cts.; Rescue brand, 85 cts.; Eureka Fire Hose Manufacturing Co., 3-ply jacket, \$1; Fabric Fire Hose Co., Keystone, \$1; Patrol, \$1; Safety, 95 cts.; Arrow, 90 cts.

BRIDGES

San Jose, Cal.—Plans for four new county bridges have been ordered by the Board of Supervisors and the replacing of bulkheads torn out by the recent floods authorized.

Perry, Ga.—Houston County Commissioners of Roads and Revenues are considering \$100,000 bond issue for improving bridges and roads.

Shreveport, La.—Bids will be asked soon by the Shreveport Commissioners for constructing traffic bridge over Red River; cost \$250,000.—George Wilson, City Engineer; Ira G. Hedrick, Kansas City, Mo.

Minneapolis, Minn.—Tentative arrangements for construction of three new bridges in Minneapolis and widening of the Plymouth ave. bridge have been made by Council Roads and Bridges Committee; Gov. A. O. Eberhart has signed \$850,000 bridge bond bill.

Albany, N. Y.—State Engineer Benschel has prepared plans for construction of portion of Schuylerville bridge; cost is estimated at \$23,553; bids will be asked at once.

Marlborough, N. Y.—Citizens will vote May 12 on \$3,000 appropriation for bridge at Main and Landing sts.

Dayton, O.—Council is considering construction of bridge across hydraulic race at Spurling ave.

Hugo, Okla.—Citizens have voted \$120,000 bonds for bridges.

Janesville, Wis.—Mayor John C. Nichols has recommended erection of bridge across Racine st.

CONTRACTS AWARDED

Paducah, Ky.—Constructing reinforced concrete bridge, 43 ft. wide and 295 ft. long, to J. A. Omburg, Memphis, Tenn., \$30,600; other bidders: Foy-Proctor Co., Nashville, Tenn., \$39,062; L. W. Hancock Co., Louisville, Ky., \$35,770; Standard Concrete Construction Co., Chicago, Ill., \$32,700; Nashville Bridge Co., Nashville, Tenn., \$34,800; Davis-Hoys Construction Co., Paducah, \$33,339.

East Las Vegas, N. M.—To the Missouri Valley Bridge and Iron Works, of Leavenworth, Kan., by Board of County Commissioners, for erection of three new bridges to be constructed by the county this year, \$14,000.

Niles, O.—To Western Reserve Lumber Co., Warren, for building of Squaw Creek Bridge at Mosier lane, \$3,898 plus 40c. per cu. yd. for excavation and \$6.62 per cu. yd. for extra concrete work as ordered by Engineer.

Portland, Ore.—Reconstruction of county bridge in West Portland district, by the County Court, to P. W. White, 923 East Couch st., \$2,650.78.

Easton, Pa.—By Northampton County Commissioners for a bridge over the Lehigh River at foot of 3d st., to Ferro Concrete Co., Harrisburg, \$109,950.

Reading, Pa.—Building bridges: Bordner's bridge, No. 1, over Tulpehocken Creek, seven miles from Rosetonia, to Carl R. Cramp, Harrisburg, \$6,925; other bidders: Nelson Meredith Co., Chambersburg, \$8,185; J. O. Sherry Co., Wyomissing, \$9,007; Ferro Concrete Co., Harrisburg, \$7,149; H. E. Ahrens Co., Reading, \$7,027; Bordner's bridge, No. 2, crossing the Swatara Creek about six miles from Myers-town, to H. E. Ahrens Co., Reading, \$6,290; other bidders: Nelson Meredith Co., Chambersburg, \$6,500; J. O. Sherry Co., Wyomissing, \$8,480; Ferro Concrete Co., Harrisburg, \$6,950; Willauer & Co., Pottstown, \$6,897.50.

Yardley, Pa.—Constructing concrete arch bridge over Delaware River at Yardley, to the F. M. Talbot Co., 1 Madison ave., New York, N. Y., about \$500,000.

Memphis, Tenn.—Shelby County Commissioners, to Memphis Bridge Co., to construct bridge over Hatchie River at Flte ave., \$13,945 for bridge at Bell's Switch,

\$3,698; for structure at Walnut ave., near White Station, \$2,285, and for structure at Hurricane Creek, near Bartlett, \$2,995; to W. F. Allen, to build bridge over Big Creek, \$3,497.

Milwaukee, Wis.—Building fender pilings around Chestnut and State st. bridges, to A. F. Bues for Chestnut st., \$375; and to J. E. Hathaway, for other, \$2,220.

BIDS RECEIVED

Indianapolis, Ind.—Construction of concrete slab bridge across Pogues run, at Highland ave.; H. F. Hackedorn, \$6,785; Pease-Buzzart Construction Co., \$7,500, and the American Construction Co., \$8,200. The estimate of City Engineer Klausmann was \$7,736.

Niagara Falls, N. Y.—Building approaches for proposed new bridge over the New York Central tracks at 11th st.: Braas Bros., \$59,987; Reed-Coddington Co., \$86,950; Eastern Construction Co., \$30,155; J. E. Johnson Co., \$26,000.

MISCELLANEOUS

Opelika, Ala.—Dr. Wm. N. Oates, State Prison Inspector, has recommended immediate erection of jail for Lee County.

Los Angeles, Cal.—Swimming pools and a general children's playground on side of Griffith Park, toward Tropic, are suggested by J. B. Lippincott Park Commissioner.

Niles, Cal.—Board of Supervisors will ask for bids for auto for Sheriff's office.

Niles, Cal.—Board of Supervisors has decided to erect brick jail.

Willows, Cal.—C. N. Russell, San Francisco, has been selected as architect for proposed \$25,000 city hall.

Pueblo, Col.—Board of Works will purchase four street washers.

Naugatuck, Conn.—Warden W. J. Neary has recommended erection of new police headquarters.

Washington, D. C.—An American Consular officer in Canada has announced that local City Engineer is considering purchase of motor type of dump wagon of about 3 tons capacity; also a motor tank wagon for street sprinkling purposes; vehicle should be adapted for use on hilly streets; engineer is anxious to receive as soon as possible catalogues and illustrations, prices to be quoted delivered in certain city. Address No. 6589, Bureau of Manufactures.

Dalton, Ga.—City has purchased site on Pentz st. for erection of combined city hall and fire headquarters.

Macon, Ga.—Architect will shortly be commissioned to draw plans for erection of building on Cotton ave. for Water Works Commissioners.

Fort Wayne, Ind.—Mayor Grice has recommended more funds for street cleaning.

Fort Wayne, Ind.—River Front Commission has recommended the employment of Morris P. Eddy, of firm of Metcalf & Eddy, of Boston, to report plan for disposal of the sewage, also plans for dams in the river to make boating possible, and George E. Kessler, of St. Louis, as Landscape Engineer.

Markle, Ind.—Citizens are urging installation of garbage disposal plant.

Noblesville, Ind.—Council is considering \$20,000 bond issue to purchase site and erect city building.

South Bend, Ind.—Architect E. R. Austin is preparing plans for building for Zoo planned by Park Board.

Catlettsburg, Ky.—City hall has been destroyed by fire.

Winchester, Ky.—Grand Jury has recommended erection of jail for Clark County.

Baltimore, Md.—Architects Archer & Allen have prepared plans for erection of \$20,000 public bath house at Greenmount and Harford aves.

Gloucester, Mass.—County Commissioners are considering erection of addition to jail and house of correction.

New Bedford, Mass.—Board of Health has rejected second proposal of New Bedford Extractor Co. to dispose of city's garbage from years 1914 to 1921 at annual cost of \$7,500.

Duluth, Minn.—Board of Public Works has advertised for bids for improvement of the Quebec pier at Bay end of Becker ave.; cost about \$6,000.

Leseoeur Center, Minn.—County Board has decided to erect county jail.

Dassel, Minn.—Citizens will vote on bonds for erection of village hall.

Tupelo, Miss.—Citizens have voted \$50,000 bonds to build city hall, improve electric light plant and pave streets.

Mexico, Mo.—Citizens have voted \$15,000 bonds to erect almshouse.

St. Louis, Mo.—E. E. Wall, Water Commissioner, has recommended revetment of river banks at cost of \$150,000; also new joint boiler house for the engines at Bissell's Point.

Central City, Neb.—Merrick County will vote May 31 on erection of \$100,000 court house; plans being prepared.

Springfield, N. J.—Springfield Township is considering erection of municipal building.

Old Forge, N. Y.—Village is considering erection of combined municipal building and engine house.

Hugo, Okla.—Choctaw County has voted \$125,000 bonds for erection of court house and jail.

Philadelphia, Pa.—Architect D. K. Boyd, 139 S. 15th st., has prepared plans for erection of \$40,000 public library at 5th and Ellsworth sts.

Darlington, S. C.—Oakes & Lamotte desire addresses of manufacturers of and dealers in metal and porcelain numbers and signposts for city street names; also catalogues.

Anahuac, Tex.—Chambers County will vote June 20 on \$43,000 bonds to erect court house and jail.

Calvert, Tex.—Citizens have defeated proposition to issue \$25,000 bonds to erect city hall.

Galveston, Tex.—Contract will soon be let by V. E. Austin, Commissioner of Streets and Public Property, for construction of a trash and garbage incinerator; cost about \$7,155.

Salt Lake City, Utah.—Council will be furnished with plans and specifications for erection of two comfort stations; cost \$5,000 each.

Beckley, W. Va.—Raleigh County is considering erection of jail.

Milwaukee, Wis.—Council has appropriated \$5,000 to Park Board for needed improvements.

New Westminster, B. C., Can.—Citizens have voted \$200,000 bonds for garbage system, bridge and electric light plant extensions, etc.—John Lee, Mayor.

CONTRACTS AWARDED

Long Beach, Cal.—Constructing combined bulkhead and sidewalk with parapet of reinforced cement concrete on Seaside blvd., from Chestnut pl. to jetties at ocean channel entrance, to J. D. Kneen Contracting Co., \$110,985; other bidders: J. C. Beer, \$130,000 and \$122,947; A. S. Bent, \$140,000; J. W. Young, \$121,499.

Asbury Park, N. J.—By the Public Grounds Commission for construction of a bathing plant and pool on the east side of Ocean ave., between 1st and 2d aves, to J. R. Taylor & Co., city, \$8,000; other bidders: Frank N. Goble, \$89,590; A. Whitehead, \$82,350; C. H. Peckworth, \$85,394; H. O. Gardner, \$82,088; J. A. Conklin, \$99,000.

New Brunswick, N. J.—Laying loose rip-rap under the retaining wall at Jamesburg, to Contractor John F. McGovern, city, lowest bidder; William I. S. Davison, of Cranbury, and Abraham Pelin, city, were other bidders.

Trenton, N. J.—Construction of a public comfort station at Cadwalader Park, to Joseph D. Smith & Son, low bidders, \$3,115, and Piper Bros., plumbing contract, \$1,730; other bidders: Andrew J. Trier, \$3,556; W. J. & J. H. Morris, \$3,175; Scott & Day, \$3,873; Stephen Dilkneit, \$3,325; P. J. O'Neill, \$3,468; S. W. Mather & Sons, \$3,398; Edward A. Lee, \$3,590; W. S. Hill & Son, \$3,336; plumbing, F. S. Katzenbach & Co., \$1,996; Greiner Plumbing Co., \$1,962; William Deckson, \$1,981.

Geneva, N. Y.—Sprinkling and flushing streets, to Edw. Higgins, \$100 per week for sprinkling and \$12.50 for flushing.

Philadelphia, Pa.—By Acting Director Hasskarl, of Department Docks, for dredging 40,000 cu. yds. of material from Delaware River, to American Dredging Co., 23½c. per cu. yd.

Seattle, Wash.—Collecting garbage in Dists. 1, 2, 3, 4 and 8, to C. E. Packard, E. 62d st. and Latonia ave.

BIDS RECEIVED

Boston, Mass.—By Metropolitan Park Commission, for construction of wooden landing piers in lower Charles River Basin, W. H. Ellis, Boston, \$8,885; George T. Rendle, Boston, \$7,545; Waldo Bros., Charlestown, \$7,380.

New York, N. Y.—Construction of a comfort station in Central Park near the Swiss Cottage, Richard Carvel Co., lowest bidder, 401 West 59th St., \$21,996.

Providence, R. I.—Oiling city streets: The Texas Co. bid on road oil in car tank lots, 3 65-100c. per gal.; the Daniels Road Oiling Co., East Providence, 1c. per sq. yd. on spraying with road oil, 4c. per sq. yd. on oiling with road oil for entire season, 3c. per sq. yd. for oiling with emulsion oil for season; the Standard Oil Co., Boston, 1¼c. per sq. yd. for spraying with road oil and for three treatments by spraying in season, 3¼c. per sq. yd.; 4 15-100c. per gal. was bid on road oil in car tanks and 5c. per gal. for emulsion in car tanks.